

## Carrier deals raise a bundle of questions

*Frame relay sparks fresh bundling debate.*

*The first of a two-part series.*

BY DAVID ROHDE

Washington, D.C.

Amid all the rhetoric about telecommunications reform, you don't hear much about bundling.

But this poorly understood rule banning carriers from packaging equipment and tariffed services under a single price tag is getting increased scrutiny from critics, who call it an anachronism. They say the bundling rule is a regulatory straitjacket that makes it unnecessarily difficult for users to

get integrated network solutions.

The bundling ban is coming under greater pressure as carriers position themselves as systems integrators handling end-to-end management of high-speed data networks and inbound 800 call centers, among other things.

Some network managers are worried that the rule — originally meant to protect customers by preventing equipment vendors from ganging up with carriers to squeeze out competition — is actually working against users these days.

The ban "makes things more difficult,"



Attorneys Nadler (l.) and Levine are split on the bundling ban.



WALTER CALAHAN

said Peter Brown, vice president of telecommunications for Cargill, Inc. in Minneapolis. "It adds to your cost structure because you end up being an integrator yourself."

Some carriers are paying big legal fees to seek special FCC waivers in what the Independent Data Communications Manufacturers Association (IDCMA), a zealous defender of forced unbundling, calls "a series of carrier assaults" on the rule.

Other carriers have introduced, or are

*See Carrier deals, page 11*

## Sun shows off its distributed mgmt. system

BY JIM DUFFY

New York

Sun Microsystems, Inc. last week burst back onto the enterprise management scene like a supernova when it unleashed Solstice, a product line that includes distributed and scalable platforms, as well as more than 300 applications.

Sun went into a solar eclipse after licensing technology from NetLabs, Inc. in late 1993 but last week emerged with 15 Solstice products and a pledge to be a leader in enterprise network and systems management.

Key products include an object-oriented enterprise management platform, multiuser capabilities for Sun's widely deployed workgroup manager, and applications for automating systems administration and protecting corporate assets from outside intrusion (NW, Nov. 14, 1994, page 1).

*See Solstice, page 52*



Sun's McNealy

### E-MAIL EVOLUTION

## Big Six firm preps for Lotus CommServer

BY ADAM GAFFIN

Hermitage, Tenn.

A distributed, LAN-based messaging network meshes well with the decentralized corporate culture at Deloitte & Touche, LLP, whose employees are more often working on laptops in the field than tied to a desk.

Yet the Big Six consulting firm has taken a decidedly centralized approach to managing its global messaging network — one that will

receive a boost once Lotus Development Corp. releases its next-generation messaging server.

Lotus CommServer's centralized directory synchronization and administrative tools will let Deloitte & Touche unite its separate Lotus Notes and cc:Mail networks. CommServer's integrated Notes/cc:Mail user directory and message store are vital to the consulting firm's plans to build a messaging backbone that supports workflow, forms routing and other groupware applications, said Larry Quinlan, Deloitte & Touche's manager of network services here.

Lotus anticipates shipping CommServer around midyear.

Notes stores user information in a database dubbed the Name & Address Book that, like other Notes databases, is periodically

*See CommServer, page 8*

**"cc:Mail-to-Notes addressing is a real pain in the neck. It's almost as bad as X.400."**

— Larry Quinlan

## Wells Fargo hops aboard 'Net wagon

BY JOANIE WEXLER

San Francisco

Wells Fargo Bank last week made an electronic commerce breakthrough when it successfully transferred encrypted payment data across the Internet in the form of electronic mail attachments.

The secure transmission of payroll payments to a large West Coast food manufacturer is part of a pilot that is the bank's first step toward offering full-blown commercial Internet-based transaction services.

Mindful of — but undeterred by — recent Internet security horror stories, Wells Fargo hopes to offer an array of services over the 'Net as

a way to attract new clients, which will be able to receive payments from their customers faster and improve their cash flow. Today, most transactions rely, at least in part, on the whims of the Postal Service.

If the idea works as planned, it could be a coup for users of electronic data interchange, which are now often restrained by sluggish point-to-point connections and links between multiple value-added network (VAN) service providers.

For instance, "if 15 people need to know about a transaction, that requires 15 transmissions [across a VAN]," said David Kurrasch, senior vice president of product development at Wells Fargo.

Using Internet mail, data can be easily broadcast in the same way a single E-mail message can be sent to multiple recipients. "The economics [of EDI] will be greatly improved, though we haven't yet taken a pencil to it," Kurrasch said.

The pilot customer hopes to get "fast, streamlined, secure electronic transactions across a broad-reaching network that is easily accessible," said a spokeswoman, who asked that her company not be named.

To provide that security, Wells Fargo is relying on Privacy Enhanced Mail (PEM), developed by Trusted Systems, Inc. for the federal government's Advanced Research Projects Agency and freely available on the Internet.

PEM can be used as an adjunct to most Unix-based E-mail applications to provide multiple layers of security.

*See Wells Fargo, page 52*



## IBM, Novell back LAN-to-host plan

BY MICHAEL COONEY AND KEVIN FOGARTY

Burlington, Mass.

Bus-Tech, Inc. is teaming up with Novell, Inc. and IBM to develop a suite of inexpensive remote branch office connectivity products.

Sources familiar with Bus-Tech's plans said the company will meld Novell's router and gateway products with IBM's 3172 LAN-to-mainframe controller and Bus-Tech's remote connectivity technology in a scalable package. The new offering will let users link multiprotocol LANs to Systems Network Architecture backbones and carry branch office SNA traffic on TCP/IP-based networks.

*See IBM, Novell, page 52*

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► **Broadband guru shares some secrets for sidestepping frame relay gotchas.**  
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# Briefs

**Service shuffle.** IBM last week shifted most of its networking systems support and services business to its Technology Service Solutions (TSS) subsidiary. The move is designed to further streamline IBM's Networking Systems group and give users more responsive consulting, planning and services, without disrupting existing maintenance agreements. Under terms of the agreement with IBM, TSS will now service IBM's networking equipment, from 6611 routers to 3174 Establishment Controllers and all the accompanying software. The only product not covered by TSS is the 3745 front-end processor, which will remain with Networking Systems.

**SONET snarling.** MCI Communications Corp. and Sprint Corp. wrangled last week about whose Synchronous Optical Network (SONET) backbone is coming up first. MCI said it would activate its SONET network in March, while Sprint officials responded that their company's major Eastern and Western rings would be completed this month and linked in April. Both have additional rings and spurs to complete before the nets are available to all the carriers' customers, and neither offered a restoral guarantee similar to AT&T's 5-minute Fast Automated Restoration.

**Oracle weaves Web plans.** As expected, Oracle Corp. this week will announce the World-Wide Web Interface Kit (NW, Jan. 16, page 1), a series of sample applications of how to enhance existing Web servers with search, retrieval and transaction processing capabilities. The kit also includes a package that uses Oracle's extensions to SQL to implement Hypertext Markup Language (HTML) operations. Available now, the kit is available on the Internet free of charge or on CD-ROM for the cost of the media.

**More from Oracle.** Oracle last week licensed technology from Visigenic Software, Inc. based on the Open Database Connectivity (ODBC) specification that will be used to build ODBC drivers to databases from Sybase, Inc., Informix Software, Inc. and Computer Associates International, Inc. The drivers will be available in the second quarter.

Oracle: (415) 506-7000.

**'Net bound.** An easy-to-install, LAN-based Internet connection package is scheduled to ship next month from Performance Technology, Inc. of San Antonio, Texas. Instant Internet includes desktop software and server software supporting Novell, Inc.'s NetWare or Performance Technology's PowerLAN, said Paul Finke, the company's chief executive officer. The package can handle 50 concurrent Point-to-Point Protocol or Serial Line Internet Protocol (SLIP) sessions and provides firewall security, a WinWeb browser, an FTP client and newsreader, as well as support for LAN-based electronic mail gateways. The unit costs \$3,495 per LAN.

Performance Technology: (210) 349-2000.

**Boeing's E-Mail flight plan.** The Boeing Co. last week chose Control Data Systems, Inc. (CDS) of Arden Hills, Minn., to supply the mail hubs for a 60,000-user global messaging network. Boeing will use CDS' MailHub software running on HP 9000 platforms to link a variety of proprietary mainframe and LAN-based E-mail platforms. The first two hubs should be installed by September to link Boeing sites in the Puget Sound region of Washington state.



**Sharing some news.** Collabra Software, Inc. this week will announce a client/server version of its Collabra Share conferencing software. Version 2.0 supports Windows NT servers and Windows clients, adds the ability to interact with Lotus Development Corp.'s Lotus Notes and Usenet conferences, features beefed-up support for remote users, and adds tools for finding specific messages. Shipping is scheduled for the second quarter, with pricing starting at \$995 per server and \$990 for 100 client licenses.

Collabra: (415) 940-6400.

**Build your own NEST.** Novell, Inc. this week is expected to announce that it is releasing the software developers' kit (SDK) for the NetWare Embedded Systems Technology (NEST) product. The SDK will let developers create applications to run on top of a stripped-down version of NetWare that's designed to be embedded in assorted hardware systems.

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**Lynn Nye** says, "Sure, why not?"

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**Louise Herndon Wells** says, "Don't be so hasty."

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## Network **HELP** desk

Network World tracks down answers to your questions regarding products, services, technologies or disputes with vendors. Please submit questions to Alison Conliffe by phone at (800) 622-1108, via fax at (508) 820-1103 or (508) 820-3467, via the Internet at [aconliff@world.std.com](mailto:aconliff@world.std.com) or via CompuServe at 75471,2725.

**Is there any way that I can log on to my Novell, Inc. server within Windows without typing "login" at the DOS prompt? I am running Novell's NetWare 3.12 and using Virtual Loadable Modules. I am trying to help my MIS director, who wants remote access to the computer in his office, using Symantec Corp.'s PC Anywhere For Windows.**

If I don't log on before Windows, it asks me to log on when Windows starts. But it seems to me this process is really an attach instead of a logon because all of the mapping in the system logon script is gone. My MIS director's problem is that he has supervisor rights with his logon. He doesn't want to leave the computer connected to the server all weekend, and he still wants to be able to access the server at home. The only way to do this is to log on from within Windows.

**I would appreciate any advice you could give.**

**Hermann Tse, San Francisco**

Ron Nutter, a network systems engineer at Intra-Source, Inc., a Novell Platinum-authorized reseller and service center in Lexington, Ky., replies:

You can try logging on to NetWare after logging on to Windows, but it isn't advisable. Windows doesn't seem to like having its environment changed after it is running.

You are correct about Windows doing an attach. You probably have some type of persistent connection configured in your copy of Windows, such as a print queue or drive mapping, that Windows is trying to reestablish contact with.

You need to set up the autoexec.bat file on the workstation to load pcAnywhere and not the network drivers. Another batch file then can call the necessary network drivers to attach the workstation to the network after the dial-in connection has been established. This will serve as a good safety precaution in case someone finds the phone number and gets on to your network.

By not leaving the PC logged on to the server, you allow the workstation to be available for remote

See Help desk, page 40



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*Business*



# Cabletron undergoes Synthesis

*Prepares plan for moving customer base to switched internets.*

BY JODI COHEN

Cabletron Systems, Inc. today will unveil its blueprint for migrating users of shared-media LAN internetworks to switched virtual nets.

Called Synthesis, the architecture defines how Cabletron will integrate switching, hubbing, routing, network management and multimedia technology in its product line. The plan hinges largely on products and technology the company has already announced, including its SecureFast Switching (SFS) and Automated Connection Management Services (ACMS), which together help users build and manage switched virtual LANs.

Michael Skubisz, Cabletron's director of product marketing, confirmed that this week's announcement is intended mainly to provide a road map that users can follow in piecing together the various hub modules and software the company has already rolled out to support LAN switching.

It will be short on new products, although Skubisz said the company plans to follow up over the next six months with products such as ATM switches and ATM switching modules for its hubs that were jointly developed with Fore Systems, Inc.

He declined to provide further details.

## MONEY WELL SPENT

The major point Cabletron will try to drive home is that users will be able to preserve their investment in existing Multi Media Access Center (MMAC), MMAC-Plus and stackable hub products, all of which will support the switching and management technologies.

Key to that will be SFS, the company's set of software and hardware that support virtual networking, enabling users to create logical LANs made up of users on different physical LAN segments. The software, formerly referred to as Secure Fast Packet Switching, provides features such as automated management of

moves, adds and changes. SFS switching code will be available by the end of this year.

And ACMS is crucial to Cabletron's plan to leverage its net management expertise, which the company hopes will give it a leg up on competitors such as Cisco Systems, Inc. Management is a key issue in switched virtual nets because it is difficult to keep track of logical connections on physically separate nets.

ACMS hardware and software will provide management of switched LAN and ATM networks, as well as support configuration management, security and customization tools.

Analysts said ACMS components will be available as an add-on board for the MMAC family and as a stand-alone personal computer-based element management system. ACMS also will work with Hewlett-Packard Co.'s HP OpenView, IBM's NetView for AIX and Sun Microsystems, Inc.'s SunNet Manager

platforms, as well as Cabletron's own Spectrum platform. ACMS products will be out by year-end.

## LAST OUT OF THE GATE

Cabletron is the last leading internetworking vendor to spell out a comprehensive switching strategy, with Bay Networks, Inc., 3Com Corp. and Cisco having beaten them to the punch (see graphic).

"Cabletron didn't want to be the first one out. They typically like to read the green and then putt," said Todd Dagres, vice president of equity research at The Robinson-Humphrey Company, Inc. in Atlanta.

According to Val Sribar, senior research analyst at META Group, Inc. in Reston, Va., Cabletron is focusing on how to leverage concepts, such as connection management, to provide quality of service

and to track what resources are being used and by whom. Spectrum will help users track traffic patterns to decide where switching is needed most.

While industry observers agreed that Cabletron needs to spell out a long-term switching strategy, some said Synthesis is little more than a name.

"I don't think this announcement will give [Cabletron] a single capability that it didn't have before," Dagres said. "[But] it does give [Cabletron] a better way to merchandise its products."

But Blair Sanders, senior member of the technical staff at Texas Instruments, Inc. in Plano, Texas, is looking forward to Synthesis.

"Until now, Cabletron seemed to lack a cohesive switching message to the market," Sanders said. "Synthesis changes all that." ■

# Vendors, users rally around 100VG-AnyLAN

BY PEGGY WATT

San Francisco

The 100VG-AnyLAN showcase here last week featured a wave of new products and pioneer users, but most participants said they are hedging their bets by supporting the rival 100Base-T high-speed LAN technology, as well.

Fourteen participants introduced more than two dozen 100VG-AnyLAN products at the VGnet '95 event, approximately tripling the current base of offerings based on the technology (see graphic).

"HP pulled out all the stops this week with the conference, trying to beat the drum and get industry support for [100VG-AnyLAN]," said David Passmore, president of Decisis, Inc. in Herndon, Va.

Regardless of the hoopla at last week's event and

the leadership of Hewlett-Packard Co. and Chipcom Corp., analysts said the 100VG-AnyLAN camp faces an uphill battle against 100Base-T and the 60-member Fast Ethernet Alliance backing it.

"It's not too early to declare victory for 100Base-T," said Michael Howard, president of Infonetics Research, Inc. in San Jose, Calif. A recent customer survey by his firm found 100Base-T beating out 100VG-AnyLAN 10-to-1.

Likewise, International Data Corp. estimates that only about one-third of the 1.1 million fast Ethernet products shipping this year will support 100VG-AnyLAN.

Both 100VG-AnyLAN and 100Base-T offer a migration path to high-speed LANs from 10Base-T, and both are nearing approval as IEEE standards. 100Base-T, which is considered fast Ethernet, requires Category 5 wiring, while 100VG-AnyLAN uses widely installed Category 3 wire. A major technological difference is 100Base-T's use of carrier-sense multiple access with collision detection (CSMA/CD) scheme vs. 100VG support for a server-based data prioritization scheme.

"100VG is a cleaner, clever technology. HP has

See 100VG-AnyLAN, page 8

## 100VG-AnyLAN product sampling

Company	Product	Price	Availability
Alfa	A4000 family of 100VG-AnyLAN adapter cards	\$225 to \$335	1Q
	A4116 16-port hub	Less than \$300 per port	2Q
Compex	HyperPipe module for FreedomSwitch	Less than \$500 per port	April
HP	100VG Selectable PCI Adapter	\$249	Now
	HP E2463A 100VG-AnyLAN test product	\$43,975	March
MultiMedia LANS ODS	6-port 100VG-AnyLAN hub	\$1,249	Now
	1094 VG18 hub	Starts at \$7,900	2Q
Plaintree Systems	100VG-AnyLAN module for WaveSwitch 100 Ethernet switch	\$2,995	2Q
Racore Computer Products	M8142 PCI-based 100VG-AnyLAN adapter	To be announced upon release	March
Ragula Systems	6- and 10-port Multimedia MiniHubs	\$1,299 and \$2,499, respectively	March
	EISA-100VG Adapter Card	\$299	March
Thomas-Conrad	TCVG045 16-bit ISA adapter and TCVG047 32-bit EISA adapter	\$225 and \$335, respectively	April
	24-port 100VG-AnyLAN hub	To be announced upon release	2Q

## Every switch way

Sorting out the top internetworking vendors' switching migration strategies.

Company	Architecture	Key components
Cabletron	Synthesis	SFC, ACMS, ATM and Spectrum net management
3Com	High-Performance Scalable Networking	Virtual workgroups, switching among routers to increase backbone bandwidth, LAN connectivity via ATM and a central routing engine
Bay Networks	Bay Networks' Switched Internetworking Services	Virtual network routing, enterprise management, and definition of logical workgroups, net access restrictions and class of service
Cisco	CiscoFusion	LAN switching at the workgroup, ATM switching at the campus and backbone, and a central route server

## NUMBERING

# Better get used to it: 888 is toll-free number

BY DAVID ROHDE

Washington, D.C.

Acknowledging that the nation will run out of 800 telephone numbers by this time next year, the Industry Numbering Committee has proposed to set up a new toll-free area code with the number 888.

Unlike traditional area code splits for regular telephone numbers, the first 888 number will not be assigned until the last 800 number is taken.

But announcement of the new code may actually spur depletion of the remaining 800 numbers. Both users and carriers have been accused of hoarding 800 numbers, particularly vanity numbers that spell out specific words and phrases. The

announcement of a new area code that won't be immediately identified by the public as a toll-free number raises the possibility of an even greater rush to reserve unused 800 number and letter

combinations.

It was not immediately clear how 800 numbers that are voluntarily returned will be reassigned following exhaustion of the 7.64 million permitted 800 numbers.

Several parties, including Sprint Corp., have suggested in a formal filing with the Federal Communications Commission that current voluntary guidelines for the recovery of hundreds of thousands of assigned but unused 800 numbers be strictly enforced to stall the need for the new, unfamiliar code.

But one 800-number product manager said it is already too late to take such action, citing the nearly 4% a month growth curve of 800-number assignments (NW, Jan. 9, page 1).

A final decision about the actual code assignment is expected at the numbering committee's March 3 meeting in Ft. Lauderdale, Fla. ■

## Onward and upward

In December 1994, the amount of 800 numbers working, assigned or reserved grew by 204,000, according to Database Service Management in Livingston, N.J.





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# Frontier and NAT extend RMON standard's reach with new wares

*SNMP products will help users track net applications.*

BY JIM DUFFY

Two vendors last week unveiled management products that extend the capabilities of the Simple Network Management Protocol RMON standard and the usefulness of information gathered by RMON probes.

Frontier Software Development, Inc. rolled out NetScout Manager 3.3, software that extends Remote Monitoring (RMON) traffic analysis capabilities to applications. Currently, RMON is used predominantly to decode protocols at the physical and data link layers of the seven-layer International Standards Organization model.

Separately, Network Application Technology, Inc. (NAT) brought out a Windows-based application for generating reports on historical network statistics and trends from data gathered by RMON probes. The tool is designed to help users do capacity planning when rolling out net applications.

"[RMON] is absolutely critical at the application layer," said John McConnell, president of McConnell Consulting, Inc. RMON will help users ensure that applications are receiving the quality of network service required for optimal performance, he said.

This is the trend that Frontier is addressing with NetScout Manager 3.3.

The software allows network administrators to monitor the performance of Lotus Development Corp.'s Lotus Notes and cc:Mail, Mosaic, Network File System (NFS) and other network-enabled applications to pinpoint potential bottlenecks before they occur.

The software also tracks LAN and WAN bandwidth utilization by application so administrators can generate more accurate accounting and billing reports.

Using point-and-click commands, network

administrators can gather statistics from applications on utilization, collisions, packet rate, packet size, traffic type and response times. Administrators can also set thresholds on application performance that will trigger alarms and deliver a snapshot of traffic statistics when they are exceeded.

The Frontier software ultimately will conform to RMON2, an emerging standard that will extend RMON beyond data link layer diagnostics and facilitate interoperability between multivendor RMON probes.

That standard is not expected for at least one more year, said Nathan Kalowski, Frontier's vice president of marketing.

NetScout Manager 3.3 will be released in phases beginning in April, when it will include point-and-click monitoring capabilities for Notes, Mosaic and NFS applications. Support for cc:Mail, as well as Sybase, Inc. and Oracle Corp. databases, will be added this summer.

The software will cost from \$2,995 to \$4,995 for new users; upgrades are free.

## CAPACITY PLANNING

NAT's Meter Reporting System is intended to help network administrators analyze network performance for capacity planning purposes.

It includes an assortment of predefined reports that can be used to analyze network utilization, performance, errors and problems, and for evaluating network design.

The software can generate reports based on information gathered from NAT's Ethernet and token-ring probes, as well as other vendors' probes or any SNMP device.

The package costs \$1,495 and will be available next week.

©Frontier: (508) 244-4000; NAT: (408) 370-4300.

According to a recent study by McConnell Consulting, less than half of the RMON users queried employ the technology for application monitoring. But in the next two years, 77% of them plan to use RMON for monitoring applications.



# Vendors plan wireless net connections

BY JOANIE WEXLER

Interoperability barriers that lock users into single-vendor wireless choices are collapsing.

Wireless integrator Racotek, Inc. in Minneapolis, for instance, plans to ship in April a wireless server with links to myriad wired and wireless nets.

Also included will be middleware tools for developing applications that can run over any of those networks; wireless SNMP extensions to LAN-based management systems; and timing, messaging and naming services for an integrated wireless/wired enterprise.

The integrated set of products, dubbed KeyWare, is a successor to Racotek's, the company's middleware that allows applications to talk over dual flavors of specialized mobile radio. The first iteration of KeyWare will expand that portability to ARDIS, Mobitex, paging, Cellular Digital Packet Data (CDPD) and wire-line links.

Users basically set up a 486-based KeyWare server on their site or on Racotek's, into which they plug wired and wireless networks that can be managed

by Hewlett-Packard Co.'s HP OpenView or IBM's NetView/6000.

Ken Dulaney, vice president of mobile computing in the Santa Clara, Calif., consulting office of Gartner Group, Inc., said the ability to port wireless applications from one network to another without change is a competitive coup for users, who gain bargaining power with carriers.

Today, users tend to get locked in with carriers such as ARDIS Co. or RAM Mobile Data because their applications have been designed for that carrier's net.

The application portability also allows users to hop on another network if their net of choice does not have coverage in a given area and allows users on those different networks to intercommunicate.

Iain Gillott, research manager of wireless communications at Link Resources Corp., a consultancy in Framingham, Mass., said Racotek has taken a big step, but that the industry still needs more widespread network coverage to make the interoperability efforts meaningful.

## HYBRID CELLULAR NETS

GTE Personal Communications Services (PCS) addressed that problem last week at the Cellular Telephone Industry Association's annual conference in New Orleans. GTE PCS said it will offer in the second half of this year nationwide hybrid services that allow users

See Wireless, page 8

# IBM rolls out host- and server-based mgmt. apps

BY MICHAEL COONEY

Raleigh, N.C.

IBM last week announced two new management applications designed to make managing large multivendor enterprises easier.

The company rolled out a package of tracking agents that bring multivendor environments under the auspices of its mainframe-based Operations Planning and Control (OPC) workflow automation system. And it also took the wraps off Version 3 Release 2 of its Trouble Ticket for AIX application, which will help users more easily track hardware and software changes on devices throughout their nets.

IBM executives said both packages will be enhanced and incorporated into IBM's Karat initiative later this year. Karat is object-oriented management technology that IBM will use to build common management applications that span all of its major systems, including MVS and AIX.

OPC is an MVS application that enables customers to use a single console to schedule, automate, monitor and control the flow of mainframe data, such as file transfers or batch jobs, over multiple network devices. In the past, OPC worked primarily with Systems Network Architecture devices, but with this release, IBM added support

for Hewlett-Packard Co. HP-UX, SunSoft, Inc. SunOS and Sun Microsystems, Inc. Solaris agents on TCP/IP nets. OPC already supports IBM's AIX-based machines.

The new agents reside on the HP or Sun workstations, and work with OPC Tracker Agent for AIX/Unix Enabler software, which runs on the mainframe. The Enabler controls the data flow from the mainframe to the agents and can automatically track, restart or reroute a failed session between the mainframe and the Unix workstation.

If the Unix users possess IBM's LoadLeveler software, OPC can also automatically redistribute workloads across multiple workstations if one of the workstations becomes overused.

"The idea with OPC is to reduce the complexity of managing the workflow distribution among multivendor networked devices by automating functions as much as possible," said Maureen Walshe, an IBM advisory programmer.

"We'd like to see IBM and other vendors migrate some of these powerful automation tools [such as OPC] off the mainframe and onto client/server systems," added Lionel Geltman, assistant vice president of Nomura Research Institute America, Inc. in New York.

See IBM, page 11

## THE BATTLE CONTINUES

# Bidding slows, but final burst likely

Bidding on the largest markets came to a virtual standstill last week, although action in midsize and smaller markets pushed the FCC's total take to nearly \$4.5 billion. FCC officials said they would probably jump-start bidding this week by implementing a rule change that, by prearrangement, signals the auction has entered its final phase.

Shown are the high bidders for each of the two available 30-MHz blocks in each of the 10 largest markets offered by the FCC. Three markets - New York, Southern California and Washington, D.C.-Baltimore - have only one block available due to an earlier award.

## Round 61, Thursday, Feb. 2

Region	Bidder	Bid (in millions)
New York	Craig McCaw	\$330.4
Southern California	Pacific Telesis	\$330.0
Chicago	WirelessCo	\$269.5
	GTE	\$269.5
San Francisco Bay Area	WirelessCo	\$123.4
	Pacific Telesis	\$132.0
Detroit	AT&T	\$81.2
	WirelessCo	\$78.1
North Carolina	AT&T	\$66.6
	BellSouth	\$70.9
Dallas-Fort Worth	WirelessCo	\$62.1
	PCS Primeco	\$62.2
Boston-Providence	AT&T	\$121.7
	WirelessCo	\$127.1
Philadelphia	AT&T	\$81.0
	PhillieCo, L.P.	\$85.0
Washington-Baltimore	GTE	\$121.3

PCS Primeco = NYNEX, Bell Atlantic, US WEST and AirTouch Communications  
WirelessCo = Sprint plus three CATV companies



# Zen and the Art of Networking

*Life is suffering.*



*All things are transient.*



*The future is an illusion.*



*And there is one path to Nirvana.*





# Novell readying OpenDoc SDK for release at Brainshare conference

*WordPerfect users to gain Internet access capabilities.*

BY KEVIN FOGARTY

Provo, Utah

Novell, Inc. is creating a flurry of activity as it prepares to roll out Internet and World-Wide Web features for its word processor, enhancements to its remote LAN connectivity product and a developers' kit for OpenDoc.

The company will release at its Brainshare conference in March OpenDoc for Windows Developer's Release 1.0, the development kit it hopes will make the world sit up and take notice of OpenDoc.

OpenDoc, an object creation and linking technology developed by a consortium of vendors — including Novell, Apple Computer, Inc. and IBM — is designed to let software developers create applications as components that users can fit together as they like, rather than having to purchase monolithic applications.

Apple released its OpenDoc software developers' kit (SDK) for the Macintosh in December.

The March release, which will be free and available across the 'Net, is the first version of the OpenDoc SDK that is fully compatible with IBM's System Object Model object-definition technology. It also will be capable of bidirectional support of Microsoft Corp.'s OLE Custom Controls (OCX), meaning OpenDoc objects can share information with OCXs, a feature OLE lacks, said Bill Kesseling, OpenDoc product manager at Novell.

OpenDoc is an improvement over OLE, but Microsoft has an edge in market share. Also, OpenDoc lacks major independent software vendor (ISV) support outside Novell, said Judith Hurwitz, president of Hurwitz Consulting Group, Inc. in Boston.

## WORDPERFECT WEB BROWSING

Novell also will announce that it is adding Internet access, a Web browser and a tool to create Web pages using WordPerfect (NW, Nov. 28, 1994, page 1). The new features are an easy way to add Internet and Web access for users, who may adapt to the new technology faster because they are getting it from a familiar application rather than from a new product, analysts said.

WordPerfect Internet Publisher for Windows is a free add-on to WordPerfect 6.1 that includes a utility to convert WordPerfect documents to Hypertext Markup Language (HTML), the native document form on the Web. It also includes templates to help users create HTML documents and button bars to add hypertext links and Web graphics.

For an extra \$49, users can buy on CD-ROM WordPerfect Internet Publisher Pro, which supports dial-up 'Net access. It includes using Novell's LAN Workplace, which adds a TCP/IP stack and support for Serial Line Internet Protocol (SLIP) and Point-to-Point Protocol connectivity to WordPerfect.

**"We are driving HTML offerings down into the mainstream and taking away the technical difficulty of it to bring it to the average WordPerfect user."**

"We are driving HTML down into the mainstream and taking away the technical difficulty of it to bring it to the average WordPerfect user," said David Harkness, product marketing director for electronic publishing at Novell.

The two products should be available in March.

Novell also will release a higher end, more flexible Web tool that supports both HTML and the Standard General Markup Language (SGML). WordPerfect 6.1 SGML Edition includes a Layout Designer feature that lets users create their own Web documents without the

templates that WordPerfect Internet Publisher uses. Those templates, which make things easier for "newbies," are too restrictive for the needs of sophisticated Web publishers, Harkness said.

The tool will let users download Web documents, edit them and repost them to the Web. It will also automatically convert HTML documents to WordPerfect format. It will go into beta-test this week and be available in May for \$595, including WordPerfect 6.1, or for \$295 as an upgrade to WordPerfect 6.1.

Novell is also readying the next major release of its remote LAN access product, NetWare Connect, which will include an application program interface (API), a NetWare 4.1 run-time and support for ISDN connectivity, according to ISVs and Novell officials. Applications integrating with NetWare Connect through the API will be able to share modems with NetWare Connect. □

## 100VG-AnyLAN

*Continued from page 4*

built a better mousetrap," Howard said. "But it will have a small following, primarily among HP's users."

Part of the blame for that falls to IBM, which switched from early endorsements of 100VG-AnyLAN to instead pursue 25M bit/sec Asynchronous Transfer Mode desktop technology, he said.

Still, HP is "committed to making 100VG the next 10Base-T," said Brice Clark, strategic planning manager at HP's Roseville Networks Division.

Early 100VG-AnyLAN users appearing at VGnet 95 — most of whom are using HP equipment — are pleased with the technology so far but are not taking sides.

"We just need to be patient and let this technology evolve," said Kevin Walsh, network specialist with the University of California at San Diego. He upgraded 22 desktop systems from a 10Base-T net-

work to HP's 100VG-AnyLAN. Although Walsh said he will evaluate 100Base-T, he expects to use more 100VG-AnyLAN technology because it is better at handling his widely dispersed networks and subnets.

The plethora of hub and adapter announcements at the event are a start, but net managers need 100VG-AnyLAN routers before deploying the technology widely, said Robert Burnside, corporate networks manager for Micrografx, Inc. He installed 100VG-AnyLAN adapters last summer in the firm's Munich, Germany, office.

Vendors understand that they will need to be flexible.

"We have demand for both," said Peter Rauch, product marketing director for Thomas-Conrad Corp. of Austin, Texas.

Then again, some vendors are focused squarely on 100Base-T.

"You will find many networking leaders exclusively committed to 100Base-T," said Jack Moses, vice president of marketing for Grand Junction Networks, Inc. in Fremont, Calif. "The key is that 100Base-T is a simple extension of Ethernet." □



(From l.) Inherited Skyehus' Per Olav Skjesol with Kevin Walsh.

## Wireless

*Continued from page 6*

out of the range of CDPD coverage to default to a circuit-switched connection to a CDPD backbone.

The GTE net, though, would recognize the transmission as IP-based and automatically apply IP security to the communication, said Chuck Napier, director of distributed management-mobile data services at GTE PCS.

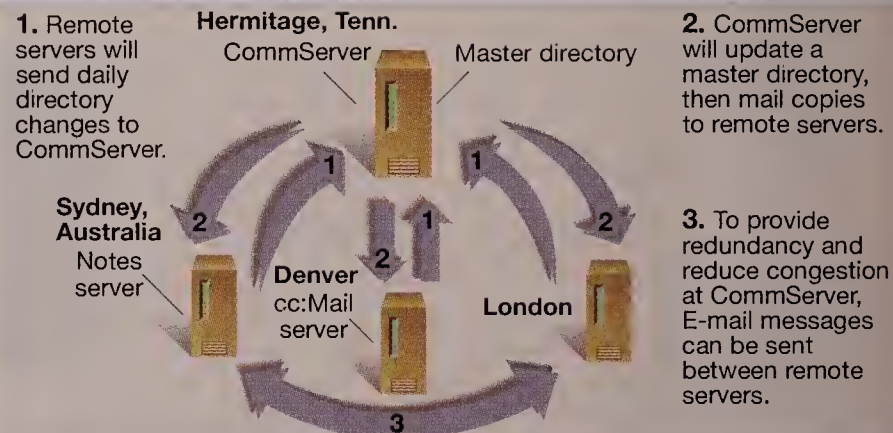
"This is a great intermediate alternative because CDPD can't be everywhere yet," said Sheldon Laube, national director of information technology at Price Waterhouse in Menlo Park, Calif., which is testing CDPD.

Napier said Motorola, Inc., Pacific

Communication Sciences, Inc. and Sierra Wireless, Inc. are building hybrid modems, and GTE PCS has teamed with these firms and several other cellular carriers have joined to develop a common API, letting an application tell the modem how to behave in a fickle wireless environment. Those applications will determine the hybrid scheme's success, predicted John Moscicki, vice president of product development at ADP Claims Solutions Group in San Ramon, Calif., which has long struggled to deploy a wireless component to its mobile claims processing application.

"The network has to default automatically. If the user has to fiddle with the connection, it'll never work," he said. □

### Directory direction



Deloitte & Touche is counting on the promised Lotus CommServer to integrate and simplify cc:Mail and Notes directory management. The cc:Mail and Notes nets now run almost entirely independent of each other.

GRAPHIC BY TERRI MITCHELL

## CommServer

*Continued from page 1*

replicated around a network. In contrast, cc:Mail stores user information in a file on the file server to which changes are made by electronic mail.

"cc:Mail-to-Notes addressing syntax is a real pain in the neck," Quinlan said. "It's almost as bad as X.400."

Because of such issues, current Notes users are urged to use cc:Mail instead of Notes mail for enterprise messaging. This limits the firm's ability to set up enterprise workflow and groupware applications. It also means users cannot take advantage of some attractive Notes mail features, Quinlan said.

But Quinlan and his staff are preparing for the arrival of CommServer and its common directory and message store for cc:Mail and Notes. Key to that is a centralized directory-synchronization system installed by Deloitte & Touche on its cc:Mail net, based on 300 file servers supporting 25,000 users in 25 countries. Rather than having all of the servers try to synchronize directories with each other, local mail administrators send any directory changes nightly to a central information systems address in Hermitage. A server there then builds a new master directory and mails it back to the local servers.

To ease the burden on the messaging hub here, the firm is looking to create a more hierarchical structure, in which directory changes for individual coun-

tries are routed through messaging hubs in those countries.

The firm now has some 120 OS/2-based Notes servers supporting about 7,200 Notes users in three countries. Quinlan's department is developing a directory replication strategy for Notes that is similar to the one in place for cc:Mail.

Once CommServer comes out, Deloitte & Touche will begin swapping out some Notes servers and cc:Mail routers, Quinlan said. One of the first jobs will be to see if the new server works as advertised in keeping Notes and cc:Mail directories up to date.

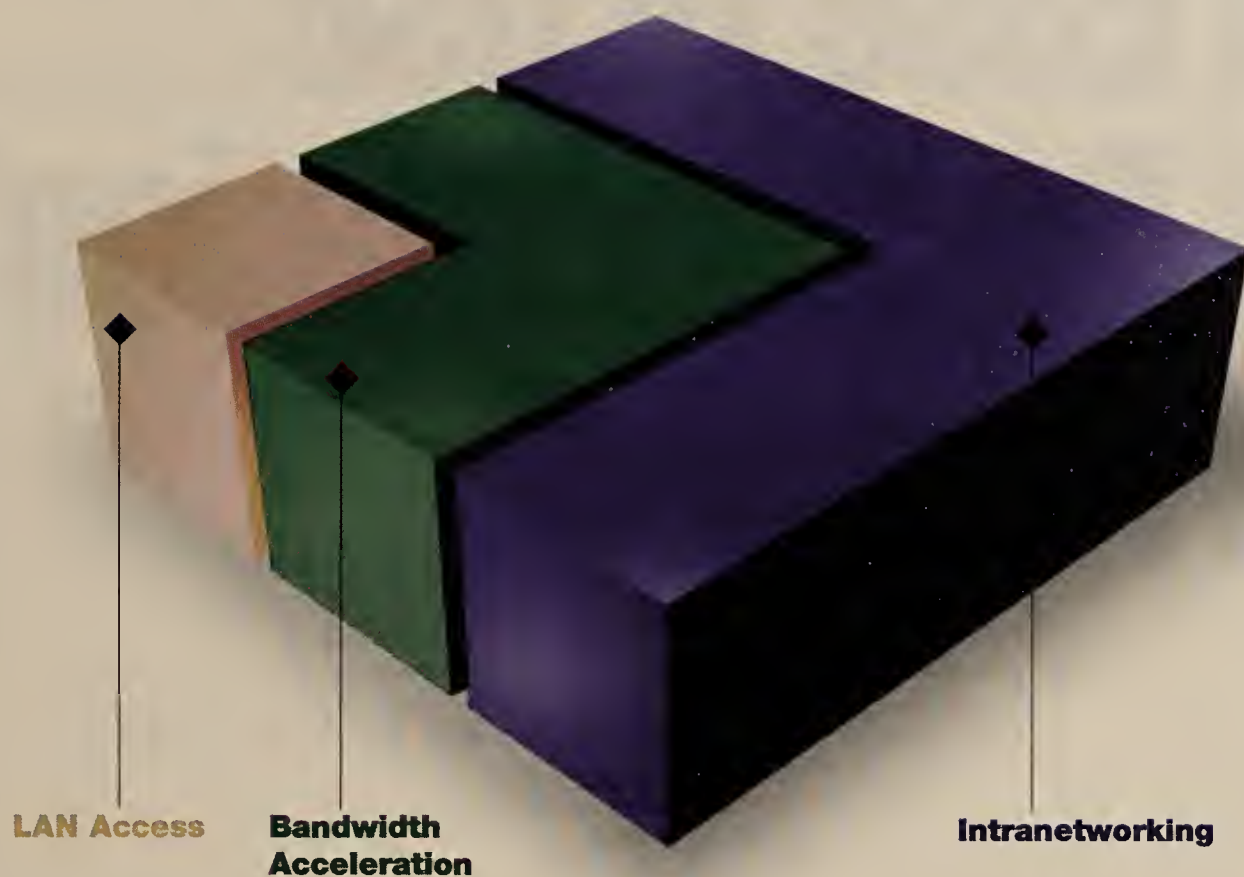
Deloitte & Touche will gradually phase in the new software, starting with servers that link large regions, then eventually moving them into smaller and smaller offices — while maintaining the same centralized directory synchronization policy now in effect with the cc:Mail net.

Initially, Quinlan will closely monitor these servers to see how they handle simultaneous Notes and cc:Mail traffic. It would be naive to think that at least some of the servers "are not going to topple over and die," he said.

While he expects the CommServer to give Deloitte & Touche an easier way to build a global groupware net, individual components of the technology will probably be fairly complex. That may force him to assign specialists to handle such areas as directories, mail flow and replication, whereas now his staff consists of four general cc:Mail analysts and three general Notes analysts. □



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## A Warped profile

### OS/2 Warp LAN Client features

- ▶ Peer-to-peer networking
- ▶ LAN Server requestor
- ▶ Windows NT requestor
- ▶ NetWare requestor
- ▶ TCP/IP base kit

### IBM OS/2 Warp editions

Version	Status
OS/2 Warp	
Regular version (no Windows code included)	Available now
Fullpack version (with Windows code included)	Wrapping up beta; available this month
PowerPC version	In beta; available midyear
OS/2 Warp LAN Client Connectivity Solution	General beta to begin soon; available 2Q
OS/2 Warp LAN Server Connectivity Solution	Beta not set; due second half of 1995

# OS/2 LAN Client to get peer capabilities

BY MARGARET DORNBUSCH

IBM is readying peer-to-peer technology that may be rolled into the upcoming LAN Client version of OS/2 Warp.

IBM isn't saying, but sources claim the OS/2 Warp LAN Client Connectivity Solution, which includes the peer-to-peer capabilities, is set for delivery during the second quarter of 1995. It is in controlled beta tests now and could go into a general beta as early as this month. A stand-alone version of the unannounced peer services software has been in beta for several months.

OS/2 Warp LAN Client is one of several Warp renditions due this year. It is expected to include not only the peer services, but also TCP/IP software and requestors for IBM LAN Server, Microsoft Corp. Windows NT and Novell, Inc. NetWare. The peer technology will allow users to hook together OS/2-based workstations for simple peripheral and file sharing.

IBM must include the peer feature in the LAN Client version to compete effectively with Microsoft's Windows 95, said Vern Dias, network analyst with Cook-Fort Worth Children's Medical Center in Fort Worth, Texas. Dias' network is a mix of NetWare, LAN Server and Application System/400 servers with more than 400 nodes. Dias has been beta-testing the stand-alone peer services product.

Dias uses the peer-to-peer software for sharing departmental peripherals

such as printers and modems. IBM's peer services offers him an advantage in that it frees him of DOS and Windows-type memory management problems, especially in cases where he is running several net protocol stacks on a workstation, he said. Some of his workstations need to run up to four protocols in addition to peer services.

Artisoft, Inc.'s LANtastic and Microsoft's Windows for Workgroups share the same problem inherent in all DOS and Windows-based peer services — only two network protocols can be loaded at once before maxing out the workstation's memory, Dias said.

For OS/2 Warp to survive, IBM must attract a wider audience for the 32-bit operating system than the company's traditional Fortune 500 set, said Richard Finkelstein, president of Performance Computing, Inc., a Chicago-based consultancy. Warp must appeal to small-to-midsize firms, and that's where peer support comes in handy.

Including the technology gives users the option to run a peer-to-peer network or use the workstation as a client, said Marty Palka, an analyst with Dataquest, Inc., a San Jose, Calif.-based research firm.

But Dias countered that a small business probably will not buy the LAN version if LAN Server or NetWare isn't already installed on its network. Rather, IBM should include the peer capabilities in its basic Warp product to make it more competitive with the base Windows 95 operating system. □

## Carrier deals

Continued from page 1

readying, combined service/equipment package deals that edge right up against the legal restrictions without quite crossing them.

Lately, the most attention has been drawn by a move that aims to expand the bundling rule, not limit it. The FCC is now considering an IDCMA petition that would force AT&T to file tariffs for its frame relay service. Legal experts say such a move would bring not only AT&T's frame relay service, but also everyone else's, under the bundling rule (see story).

Frame relay is currently considered an enhanced service that does not fall under the bundling rule, and many customers have taken advantage of combined service/equipment packages from carriers such as AT&T, which is the frame relay market leader.

The stakes are huge. If the FCC agrees with IDCMA's logic on frame relay, other fast-packet offerings, such as emerging Asynchronous Transfer Mode services, may be brought under the tariff and unbundling restrictions.

"Users are profoundly offended by arguments, from people who favor forced unbundling, that this is in their interest," said Hank Levine, a partner in the Washington law firm of Levine, Blaszak, Block & Boothby. "The solutions that work are usually bundled solutions."

Levine and others believe telephone companies generally should offer unbundled options with equipment of the user's choice. "The user ought to have the option of doing it either way," added Al Bieber, immediate past president of the Communications Managers Association and a telecommunications manager at Dow Jones/Telerate in Jersey City, N.J.

### SINGLE POINT OF CONTACT

Defending the bundling rule with nearly religious zeal is Jack Nadler, one of several Washington attorneys for the IDCMA.

"We do not dispute the right of AT&T to offer one-stop shopping," Nadler said.

But he added that the carrier must sell all the pieces of the solution at the same prices as when they are sold separately.

But that is difficult to police because most carriers' frame relay prices are not publicly disclosed. And even if the prices were filed in a legal tariff, analysts

note, users would almost certainly negotiate discounted rates in contract tariffs, just as they do for switched and private-line services today.

In 1993, the IDCMA helped force NYNEX Corp. to open up its popular Enterprise private-line service to makers of intelligent channel banks other than Newbridge Networks, Inc. The issue caused a split within the FCC, with many staff members backing the service as originally offered.

Many equipment vendors, seeing their own sales through carriers surge, seem reluctant to support the IDCMA's vocal stance.

IDCMA's membership shifts depending on the issue at hand, but the only two permanent members Nadler would name are General DataComm, Inc. and Racal-DataCom, Inc. The association attempted to boost support among vendors with a briefing during the recent ComNet '95 trade show.

Another vendor official expressed bitterness over the lack of support from the big router makers. "Cisco doesn't want to get involved because they can sell three times as many routers through AT&T," he said.

Yet even his company has not yet decided to join IDCMA. For its part, AT&T

officials said they are happy to test any customer premises equipment on behalf of a frame relay customer that requests it.

For the time being, carriers are finding that deals must be carefully structured to avoid regulatory problems.

This week, for example, Sprint Corp. and Rockwell Switching Systems Division are expected to flesh out a recent agreement under which Sprint customers can get Rockwell's Spectrum automatic call distributor (ACD) without shelling out any cash. They pay for the device on a per-minute usage basis in conjunction with Sprint's 800 services.

To comply with the bundling rule, Rockwell will be responsible for setting a baseline ACD price for each customer depending on the user's unique call center configuration, said Ken Kraft, group manager of sales support for Sprint's Business Services Group.

Then the ACD price will be divided by the expected minutes of usage over the life of the Sprint 800-services contract. Finally, the per-minute bill for the ACD will be delivered separately from the 800-services bill, Kraft said.

Next week: Part 2 will examine bundling's impact on customers.

## Bundling defined

The FCC's bundling rule says all carriers that sell customer premises equipment (CPE) must do so on a separate basis from their tariffed services.

In practice, this means carriers cannot require a customer to buy a specific piece of CPE to obtain a particular service and cannot offer deals in which a package of services and equipment costs less together than they would if purchased separately.

The bundling rule does not apply to services involving "computer manipulation" of customer data by a carrier. Such services are considered value-added and don't have to be tariffed. For example, frame relay is considered an enhanced service because it may involve net-based protocol conversion and manipulation of the discard-eligible bit.

On rare occasions, the Federal Communications Commission makes exceptions to the bundling rule, such as in 1992, when it ruled that cellular services could be bundled with equipment. The

reasoning was that in the wireless arena, people often first buy a cellular phone, then seek a carrier — the reverse of the wire-line market.

The bundling rule is not part of the Communications Act of 1934. Rather, it dates back only to March 1, 1982, when the FCC codified the second of its three big investigations into ties between the telephone and computer industries.

Advocates of loosening the rule note that Computer II Inquiry was completed less than two years before the Bell system was dismembered. Had it been completed a couple of years later, they argue, the FCC would have taken care to distinguish between big and small carriers in applying the rule.

But as it stands, the rule applies equally to all common carriers that file tariffs. And that, according to a Supreme Court ruling last year, means all common carriers under the sun.

BY DAVID ROHDE

## IBM

Continued from page 6

OPC Tracker Agent for AIX/Unix Enabler ranges in price from \$690 to \$17,570, and agent software costs \$150.

In an effort to help users manage their changing network configurations, IBM added a change management feature to its Trouble Ticket for AIX application. With the new feature, users can record, track and control the movement of hardware and software in a distributed environment.

Until now, the Trouble Ticket application, which runs on IBM's NetView for AIX management platform, created reports that helped users monitor and

track hardware or software failures, as well as net trouble spots.

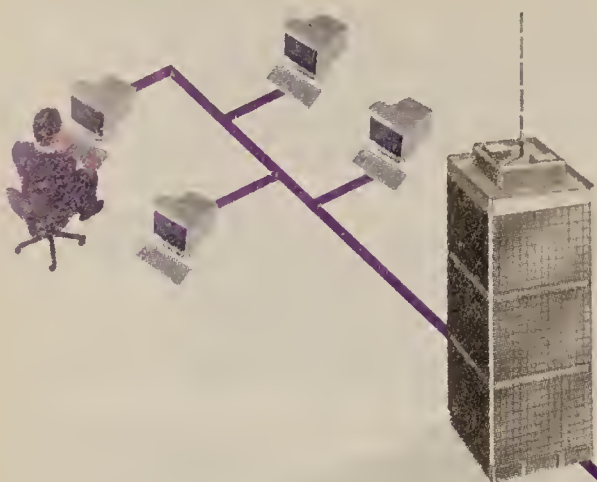
"Users can now define in Trouble Ticket something as small as a PC moving from one place to another or as large as moving an entire office net complex, and it will go out and monitor those changes and report back when they are complete," said Jim Shaughnessy, Trouble Ticket's product manager.

These change management features are similar to those offered on IBM's mainframe-based Information/Management product.

Trouble Ticket for AIX 3.2 is available for \$11,500. Existing 3.1 users can upgrade for free, while all other version upgrades will cost \$3,000.

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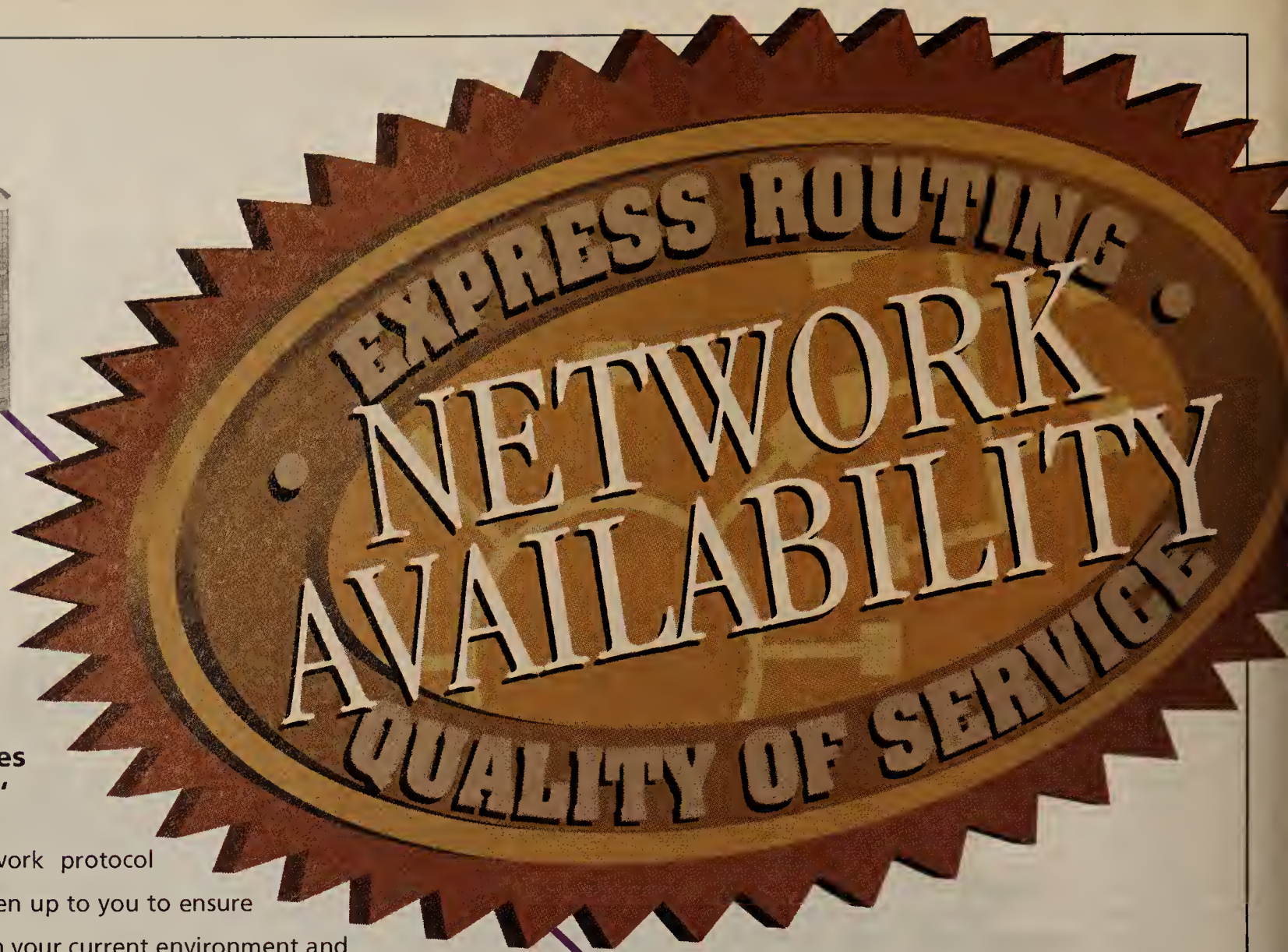
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# ENTERPRISE INTERNETS

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## MILITARY NETWORKING

### Defense Dept. plots private ATM migration strategy

BY ELLEN MESSMER

Arlington, Va.

The Department of Defense is planning to install and operate its own worldwide ATM backbone network, a strategy that could result in a Defense Department victory but a loss for carriers providing ATM services.

The Defense Information Systems Agency (DISA), which plans WANs for the military, said a private Asynchronous Transfer Mode backbone with switching hubs controlled by the military appears to be the best approach to ensure flexibility and security in transmitting sensitive information.

The ATM network, first deployed across the U.S., eventually would absorb the hundreds of millions of dollars worth of annual voice and data traffic and equipment spending now lav-

ished on the Defense Commercial Telecommunications Network, provided under an AT&T contract that expires in February 1996.

Dubbed the Defense Information Systems Network, the new backbone would use leased lines operating at Synchronous Optical Network (SONET) speeds of 155M bit/sec and higher connected to a variety of military-owned ATM switches, multiplexers and other access equipment.

The precise network architecture and the cost still needs to be worked out, acknowledged DISA Director Lt. Gen. Albert Edmonds and Assistant Secretary of Defense Emmett Paige in the Defense Department's summary of the plans.

The private ATM network strategy represents an about-face for DISA, which last year said the Defense Department would likely

abandon its timeworn practice of owning switching equipment in favor of leasing services directly from commercial providers.

But network break-ins and other security concerns may have prompted DISA to seek maximum control over its net.

But some carriers are complaining that DISA's plans to largely forego purchase of public ATM carrier services deprives them of an influential early user.

The DISA ATM plan is a "high-risk strategy," said Tim Long, a member of the executive staff at MCI Communications Corp.'s government systems.

"The Defense Department would have the government investing in massive equipment buys that may rapidly become obsolete," said Long. "ATM is high-risk for [the carrier] industry, too. But that risk belongs with industry to invest in technologies that are still evolving."

But some analysts disagree.

"There is no nationwide ATM service," said Thomas Nolle, principal with Voorhees, N.J.-based consultancy CIMI Corp. "The Defense Department could probably deploy ATM faster than the public carriers and run it more cheaply for five years."

But selecting ATM as a backbone transport for both voice and data does pose problems, Nolle warned. "The voice standards for ATM haven't advanced enough to describe how it's



Top Pentagon official Emmett Paige OKs private ATM network plan for the Defense Department.

done," he said.

Nolle added that the fear of purchasing equipment that quickly becomes obsolete is probably unfounded because the most significant changes in ATM equipment will come in the form of software upgrades.

Since DISA has changed its mind a number of times concerning its future network strategy, vendors are waiting to see whether Defense Department officials will stick to their guns this time — or if they are simply floating an idea in typical Washington style to get feedback.

"The Defense Department has enormous purchasing power," said Jim Payne, director of marketing in Sprint Corp.'s Federal Systems Division. "Whatever they do, we hope they allow the best in industry to compete and manage it effectively." □

## BRIEFS

Cisco Systems, Inc. has introduced 10 DC-powered versions of its routers for use in telephone companies, utilities and service provider environments.

Seven Ethernet-based models of the Cisco 2500 remote access family (including two Access Servers), the mid-range Cisco 4500, and the high-end Cisco 7000 and 7010 can be ordered with a DC power supply instead of the standard AC supply. The DC power option will let Cisco routers be directly connected to the DC power sources typically used in telephone company central offices and service providers' points of presence.

Cisco's DC-powered routers, available immediately in the U.S., will be available worldwide starting in March. DC-powered Cisco Access Servers will be out in April. DC-powered chassis pricing ranges from \$1,495 for the Cisco 2500 to \$6,500 for the Cisco 7000.

Cisco: (408) 526-4000.

Octagon, Inc., a Reston, Va.-based international telecommunications and information systems company, has acquired Allink Network Management Co. of White Plains, N.Y.

Octagon's wholly owned telecommunications subsidiary, OCTACOM, will own and operate Allink.

Allink develops the Allink Operations Coordinator integrated network management system. Octagon said it acquired the company because of its "advanced capabilities in the creation and application of communications-oriented expert systems technology."

Octagon: (703) 716-4200.

## Comdisco tests ATM switches and services

*Firm targets technology to support bandwidth-intensive disaster recovery.*

BY DAVID ROHDE

Rosemont, Ill.

Comdisco, Inc., whose computer and network disaster recovery business makes it both a key user and supplier of information technology, is testing a variety of Asynchronous Transfer Mode switches as well as AT&T's and WilTel's ATM services.

Comdisco hopes not only to boost the capacity of its internal network, but also to use ATM for dramatically broadening its service offerings to other companies.

In particular, Comdisco is interested in providing electronic data vaulting over wide-area connections as an alternative to traditional off-site data storage services, said John Sandberg, Comdisco's vice president of networking products and services.

Such electronic mirroring would require enormous amounts of bandwidth, particularly if it involved many Comdisco customers simultaneously, analysts said.

In addition, Comdisco wants to be able to provide network recovery for emerging WilTel and AT&T ATM customers that are also Comdisco customers.

To support cell relay transmission

between its offices here and in North Bergen, N.J., Comdisco has been testing Newbridge Networks, Inc.'s 36150 ATM switch and General DataComm, Inc.'s Apex ATM switch.

In addition, Sandberg confirmed that the company this month will begin testing one or more of Northern Telecom, Inc.'s Magellan ATM switches.

But "ATM service is not the end goal for us," Sandberg said. "It's the vehicle for delivering our service capability."

To match the same level of redundant storage achieved on customers' own LANs through wide-area data vaulting, "you have to restore data back to a server — not in hours or days but in minutes," he added.

Comdisco customers also are concerned about restoration of constant bit rate (CBR) traffic, which is typically voice or video,

said Dennis Cook, Comdisco's senior manager of facilities design at the company. One of the typical applications in disaster recovery is redirecting 800 calls, he noted.

Effective deployment of ATM represents a significant business opportunity for Comdisco, said Christine Heckart, senior analyst

for TeleChoice, Inc., a consulting firm in Verona, N.J. Most corporate users do not make regular payments to a firm such as Comdisco as part of an insurance plan to ensure the use of hot or cold sites in a disaster, she explained.

As a result, Comdisco is looking to establish a suite of alternative, more cost-effective data backup solutions.

"Maybe you can't afford to pay this high-end disaster recovery plan," Heckart said. But with ATM, Comdisco could "hook up into each one of your servers and get your information and store it so you don't have to back up data yourself."

In its WilTel trial, announced last month, Comdisco is using T-3 access links into the WilTel long-distance network. Testing has focused on T-1 CBR channel extensions, a 100M-bit Transparent Asynchronous Transmitter/Receiver Interface for transport of router traffic, and interconnection of Ethernet, token-ring and Fiber Distributed Data Interface LANs.

If it wishes, Comdisco can even take the WilTel ATM service and, in effect, resell it by packaging it with its own services, said Bob Decker, WilTel's ATM product manager. "Comdisco has full latitude on a customer-by-customer basis," he said.

Sandberg would not discuss details of the AT&T trial, which has not been publicly announced. AT&T officials confirmed the trial and said details would be released in about a month. □

### Taking a test-drive

Vendors involved in the Comdisco ATM trial:

- ▶ **AT&T**  
Public ATM service
- ▶ **WilTel**  
Public ATM service
- ▶ **Newbridge**  
MainStreet 36150 ATM switch
- ▶ **GDC**  
Apex ATM switch
- ▶ **Northern Telecom**  
Magellan ATM switch products



by Scott Bradner

## Is network security an oxymoron?

**W**ell, Internet security (or the lack of it) has made the news again. The latest incident resulted in a front page story in

*The New York Times* (below the fold, though) and articles in *The Wall Street Journal* and *The Washington Post*. All this at a time when, as I have previously written in my column, more

organizations are deciding against creating their own private universes in favor of building their future on the Internet.

The problem to which all these articles were responding is, as they say, a neat hack. For those of you who did not get the details, it involves three facts of life on the Internet and in some TCP/IP implementations.

First, in the IP part of TCP/IP, as in almost all other network protocols, data is sent between two network connected hosts in a stream of packets. Each packet includes the destination and source network addresses of the two hosts. Each router looks at the destina-

tion address to guide the packet through the network. The source address is not used in this process.

Second, when a packet reaches its destination, the source address is used to ensure it is from a specific host. A packet with a forged source address is thought by the receiving host to have come from a place other than from the host that actually sent it.

Third, in order to ensure reliable transmission of data, the TCP part of TCP/IP must have some way of checking to see if the destination has received all of the packets that have been sent its way. Each end of a network conversation, therefore, sends acknowledgment packets after it receives some data from the other end. To keep track of that process, each data packet has a sequence number, which is referred to in the acknowledgments.

If somehow I can predict which sequence numbers would be used in a conversation between two hosts on your corporate network, I can send packets to one of those hosts forging the source address of the other and include calculated acknowledgment sequence numbers. If I do this, the target host thinks it is having a conversation with its trusted partner even though it is not.

Now I don't get the half of the conversation that the target host is sending because that is going to the host whose address I forged. But that does not matter if I'm trying to do something very predictable, such as modify some access control files. It turns out that it is quite easy to guess the sequence numbers that some Unix computers will use and, thus, easy to do this spoofing.

It is also easy to keep someone out there in Internet land from doing this to you because many routers can be configured to discard packets coming from the outside world with a source address that is from within your organization. You also have to block source routed packets to be completely secure. As long as your internal hosts do not form a trusted relationship with someone outside your organization — by using NFS, for example — you will be fine.

So in light of things like this, will the problems of security on the Internet put a damper on its growth curve? It might, but "that would be wrong," as Richard Nixon once said. The main thing that is often lost in the Internet security laments is that most cases of network and host security violations involve local people with authorized access to the local net, not people from halfway around the world.

The forthcoming IPv6 will make some of the current security issues easier to deal with in the future, but not connecting to the Internet or erecting a big firewall is not the whole answer. Look in the mirror before looking out the window.

Disclaimer: Harvard is currently trying to deal with the security of its network, but the above only reflects my own views.



Hannover 8th - 15th March, 1995

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→ Bradner is a consultant with Harvard University's Office of Information Technology. He can be reached via the Internet at [sob@harvard.edu](mailto:sob@harvard.edu). Bradner shares this space with Dan Minoli, whose column will appear next week.



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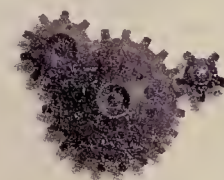




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# LOCAL NETWORKS

Operating Systems, Management, Hubs, Adapters and Other Equipment

## LAN SWITCHING

### NRC launches into E-net switching mart

BY JODI COHEN

San Jose, Calif.

Network Resources Corp. (NRC) will make its foray into the Ethernet switching market this week when it announces a stackable switching hub with management and routing capabilities.

The MultiGate Switch is a 12-port device that will let users migrate from shared-media LANs to switched ones at their own pace by supporting both shared and switched Ethernet circuits. The switching hub features plug-in, single-port modules for 10Base2, 10Base-T and 10Base-F.

The switches are designed so that as many as 17 of them can be interconnected, providing a total of more than 200 shared or switched Ethernet ports. They can be managed locally via a built-in console port or remotely via telnet or a Simple Network Management Protocol console.

Future enhancements will include a high-speed uplink for connection to a server or backbone. Fiber Distributed Data Interface, 100Base-T and 100VG-AnyLAN uplink modules will be available by the end of March, and an Asynchronous Transfer Mode module will emerge in the second quarter.

NRC, which also makes routers, will add routing support to the switching hubs in the second quarter for IP, IPX and AppleTalk net traffic.

See NRC, page 35

## Intel intros all-in-one LAN mgmt. pack

*LANdesk Management Suite 2.0 adds support for DMI specification.*

BY MARGARET DORNBUSCH

Hillsboro, Ore.

### Reality Check

**Product:** LANdesk Management Suite 2.0  
**Company:** Intel

#### The benefits:

- Integration of LAN management tools.
- DMI support.
- OLE-enabled for third-party tool integration.
- New tools, including software distribution, metering and threshold alerts.

#### The drawback:

- Lacks support for Novell NASI, which would allow network modems to issue pager notices.

#### The user view:

“This package is going to kick off a whole new management style for Johnson Controls.”

Andrew Drummond

Intel Corp. last week introduced an upgrade to its LANdesk Manager Windows-based LAN management suite that features software distribution and metering capabilities, threshold-based alerts and support for the Desktop Management Task Force's (DMTF) Desktop Management Interface (DMI).

LANdesk Management Suite 2.0 also improves upon previous versions of Intel's server- and desktop terminate and stay resident (TSR)-based LAN management tool collection by providing tight integration between the tools.

The suite allows LAN managers to execute tasks across applications, and access features and functions of the other tools, said Mike Maerz, vice president of Intel Products Group and general manager of Intel's Network Products Division. For example, the software distribution and metering tool uses both software and hardware inventory information, as well as remote control, to give LAN administrators the ability to build distribution lists, he said.

### LANDESK IN ACTION

LANdesk Management Suite 2.0's integration will revolutionize workstation management at Johnson Controls, Inc. by enabling the firm to move away from different vendors' incompatible LAN management tools, said Andrew Drummond, LAN manager for the company's Auto Systems Group in Plymouth, Mich.

“If we had a backup project, we used one company's backup tool; if we had a metering project, we used another company's metering tool. There was no connection,” said Drummond, whose group's network links 5,000 workstations.

The suite's new software distribution and metering feature alone justifies the suite's cost, as Drummond figures he will be able to upgrade thousands of workstations with a simple software command. “We've made it a standard that every workstation on the LAN will have LANdesk on it,” he said.

To help ease management of desktops, LANdesk now supports DMI. This specification was developed by the DMTF to provide standard information on all workstation and workstation-attached hardware, such as network adapters and modems.

LANdesk features a graphical user interface-based DMI control panel that provides remote access to Management Information Files storing DMI data. A LAN administrator can schedule daily tests that query DMI-enabled devices to check for error conditions.

LANdesk's new support for OLE will enable users to build their own management applications to work with LANdesk and allow it to integrate with third-party OLE-enabled tools, Maerz said.

LANdesk Management Suite 2.0 is available now starting at \$595 for a five-node license. Additional nodes are available for \$40 to \$50 per node, depending on quantity.

©Intel: (800) 538-3373.

## Novell to cash in on MPR bundling

BY KEVIN FOGARTY

Provo, Utah

Novell, Inc.'s Multiprotocol Router (MPR) 3.0 is leaving behind its provincial NetWare-centric beginning and hitting the road to seek its fortune as an inter-operable product.

The prospects already look good: Newbridge Microsystems, Eicon Technology Corp. and ADC Kentrox all are preparing to ship MPR bundled with their WAN access products.

Novell is also working with a consortium of data service unit/channel service unit (DSU/CSU), router and other internet-working equipment vendors to come up with a common specification for compressing data as it is routed across WANs, according to Mark De La Vega, product-line manager for Novell's Network Infrastructure Division.

### A NEW ATTITUDE

Since Novell reorganized late last year, its product divisions have gained profit-and-loss responsibility, prompting product-line managers to try harder to make money with their wares, rather than use them solely to help sell more NetWare, De La Vega said. One

way product-line managers are looking to generate more revenue is by pairing with other vendors.

MPR will come bundled with a pair of WAN access cards from Newbridge Microsystems of Ottawa. The software will come with the two-port T-1 and four-

### Third-party support

Company/Product	Product description	Availability	Price
ADC Kentrox/WANCard NW56	DSU/CSU	March	\$1,095
Eicon/MPR Advantage	Router card that off-loads processing and data compression from the server; relies on Eicon's X.25, frame relay and ISDN capabilities.	April	\$1,995
Eicon/MPR PacketBlaster	Router card bundled with MPR's GUI and configuration technology; router processing handled by server; can support MPR's X.25, frame relay and WAN diagnostic features.	Now	\$1,595
Newbridge/Sprite	MPR on WAN access cards; does HDLC encapsulation to get LAN traffic to the WAN.	This month	\$2,195: branch version; \$2,695: enterprise version

GRAPHIC BY TERRI MITCHELL

port 256K bit/sec versions of Newbridge Microsystems' Sprite WAN cards.

Eicon will ship MPR with two of its WAN products, MPR PacketBlaster and MPR Advantage, while ADC Kentrox of Portland, Ore., will bundle MPR with its WANCard NW56, a 50K bit/sec DSU/CSU.

©Novell: (800) 638-9273; Newbridge Microsystems: (613) 591-3600; Eicon: (800) 803-4266; ADC Kentrox: (800) 733-5511.

## BRIEFS

**Adaptec, Inc.** last week launched a set of new networking products. The Milpitas, Calif., company announced the NIOBE family of **Asynchronous Transfer Mode** network interface cards (NIC), which includes: the Server/High-Performance line for high-end servers; the 155M bit/sec PowerDesktop line for high-performance desktop systems and departmental servers; and the 25.6M bit/sec Desktop25 line for desktop systems.

Pricing for the PowerDesktop line starts at \$895, while the Desktop25 line starts at \$349. The NICs will be available in the second quarter. Pricing information was not released for the high-end server line, due late this year.

**Hewlett-Packard Co.** this week will introduce a series of **optical jukebox systems** for document and image storage that can tie to a server or directly to a network.

The HP SureStore Optical 80st Jukebox is a two-disk transport system that handles disk exchange time in 6 seconds. The 80st family offers storage capacities of 40G to 98G bytes

with two or four drives and 32, 64 or 76 cartridge slots. The drives are available now, and pricing starts at \$16,400.

HP: (800) 826-4111.

**Alantec Corp.** has released a new **Ethernet Routing switch** that includes a Fiber Distributed Data Interface connection, as well as routing and bridging capabilities. The PowerHub 3150 includes 12 10M bit/sec Ethernet ports, plus one 100M bit/sec FDDI ring with a slot for a second one.

It supports TCP/IP, IPX, DECnet and AppleTalk routing, and costs \$14,950.

Alantec: (408) 955-9000.

**Brooktrout Technology, Inc.** last week announced its TruFax line of multichannel **fax boards** for network servers.

The first product to be released, the TruFax 200, is a two-channel Industry Standard Architecture-based board that supports 14.4K bit/sec fax transmissions. It costs \$799 and is available now.

Brooktrout: (617) 449-4100.



## NET RESULTS

by Mark Gibbs

# Guinea pigs of the world, arise

**D**o I look like a small furry animal (see accompanying picture)? Do you?

No, of course not — at least I

hope that's what you said. So why is it that software and hardware vendors insist on treating us like guinea pigs?

I ask this because it is a fact that many ven-

dors have no qualms about rolling out half-finished, half-baked products.

Worse still, they then think nothing of sitting back and making feeble attempts to field our support calls we have to make on our own dimes.

My favorite support-a-thon is the 90-minute hold when calling in to Redmond, Wash., while a demented DJ tells you how many people are waiting in the queue. But I digress....

What fired me up was upgrading from Novell, Inc. NetWare 4.01 to Version 4.1. After looking at the huge list of fixes and corrections, one realizes how much was in need of repair.

Yet the product was sold as if it were complete.

The same applies in spades for Windows. Remember the agonies of the previous versions and the wild hope that Version 3.1 would fix them? Ha!

What do we have in Windows today? One of the most cranky, funky and downright aggravating pieces of code that you wouldn't want to run on your network unless a gun was being pointed at your head.

Unfortunately, in the case of Windows, a gun really is being pointed at your head — and the gun is loaded with two bullets called market pressure and momentum.

You have every right to ignore a product like Windows completely. Unfortunately, in many respects, Windows is the only game in town.

So why do vendors treat us like guinea pigs? Because they can.

The computer industry has fostered a market ethic that makes the leading edge the bleeding edge.

In fact, for many users, Release 1.0 of any product has become the magic formula that defines their own assessment of market position.

On the other hand, there is a large group of users that refuses to buy into Release 1.0 on principle. These users assume that Release 1.0 is going to be problematic, so they are quite happy to wait for Version 1.X or even 2.0.

Both of these responses are wrong when they are absolute — that is, when they are the standard response to any new product. The problem for users is that there are times when going for it is actually the best plan and times when holding off is really the wisest choice.

At the vendor's end, the problem is how to manage the user and ensure that new products get an adequate buy-in.

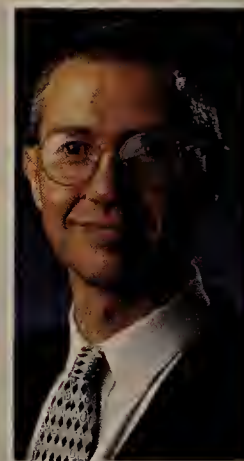
I would suggest that vendors always need to offer support for Release 1.0 products via a toll-free number and be committed to customer satisfaction.

But making customer service a core, strategic concern demands dedication and action. If there is a problem, then it must be fixed. And then you need to tell all your customers that the problem exists — don't expect them to find out by searching CompuServe or the Internet.

As for the users, remember that you vote with your dollars. Don't buy products that don't have bundled support services and satisfaction guarantees. If you can't return the product because of problems with it or the supplier, then you are working with the wrong vendor.

When a product stinks, be prepared to say so. Indeed, go out of your way to be obnoxious about problems. Post messages everywhere and write the vendor — make sure that the company knows it has failed the test of the marketplace.

Guinea pigs of the world, arise! You have only rotten software to lose and your network application reliability to gain.



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♦ Gibbs is a consultant and writer in Ventura, Calif.  
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# Why to switch.

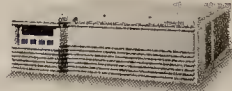
Switching is the most cost-effective way to add bandwidth to your network.



LinkSwitch hub

# How to switch.

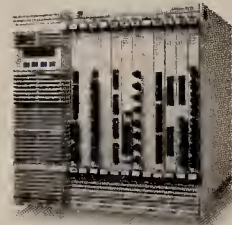
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# When to switch.

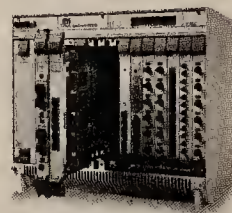
Now. Because you can immediately make better use of your network.



LANplex 6012

# Where to switch.

Many times it's where you're currently routing. You may need both.



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# GLOBAL SERVICES

Voice and Data Services, Mobile Computing, Regulatory Issues and Voice CPE

## IP SERVICES

### CIX emerges as trade group for 'Net providers

BY ELLEN MESSMER

Washington, D.C.

The Commercial Internet Exchange (CIX), a group of IP service providers, has laid aside its controversial plan to filter out commercial IP traffic from nonmembers.

The group operates a router through which virtually all commercial Internet traffic must travel and has taken the first steps toward becoming a formal trade group. Until now, CIX has been a loose conglomeration of 155 members, both large and small.

Instead of debating the controversial filtering plan at a meeting held in conjunction with the recent ComNet show here, CIX members focused on improving packet exchange for its members by adding a fiber-based ring where large IP providers could connect using 34M bit/sec Switched Multimegabit Data Service.

Led by Bob Collet, CIX's new chairman and president. See CIX, page 24

## BRIEFS

Although it was spun off from Pacific Telesis Group last April, **AirTouch Communications, Inc.** has been told by the Department of Justice that as a "Bell successor," it is still **prohibited** by the Modified Final Judgment (MFJ) from providing **long-distance service**. AirTouch said it intends to ask District Court Judge Harold Greene, who oversees the MFJ, to rule otherwise. Greene agreed not to take action against the company until a final decision is made. AirTouch presently offers long-distance services for completing cellular calls in four markets.

**Northern Telecom, Ltd.** reported 1994 **profits of \$404 million**, a huge turnaround from its \$884 million loss in 1993. Revenue was up substantially for wireless systems, up somewhat for private branch exchanges (as part of a group called Multimedia Communication Systems) and flat for central office switches.

**AT&T and Intuit, Inc.** said they have teamed to allow users of Intuit's TurboTax tax preparation software to **electronically file** state and federal tax returns using AT&T Mail. Initially, AT&T Mail will be incorporated in TurboTax products for state sales tax returns filed by businesses and those who prepare tax returns for businesses.

**Cable & Wireless, Inc.**, the U.S. unit of the international long-distance company, said it will **invest \$120 million** in its network over the next four years, in part to offer customized services and provide intelligent wideband switched video, multimedia and data services.

## Sprint stuns users with rate hike

The 15% private-line boost puts prices on a par with AT&T's, ahead of MCI's.

BY DAVID ROHDE

Washington, D.C.

Sprint Corp. has raised its T-1, fractional T-1 and digital data service rates by about 15% across the board in a move likely to be among the first of many designed to shore up its profitability.

### No escape from price hike

Monthly prices for a 500-mile T-1 leased line from Sprint.

Contract term	Old price	New price	Increase
No term or volume commitment	\$4,305	\$4,965	15.3%
3-year term; \$20,000/month commitment	\$2,714	\$3,127	15.2%
5-year term; \$100,000/month commitment	\$2,326	\$2,683	15.3%

Prices do not include T-1 access lines from LECs at either end.

The huge rate boost — which Sprint officials concede puts its private-line rates virtually on a par with AT&T's and well above MCI's — caught users and analysts by sur-

prise. Some users last week were unaware of the move, despite claims by Sprint spokesmen that they were informed by letter.

"Part of the reason I went to [Sprint] in the first place is they were more cost-effective than the competition," said Ray Meyers, director of management information services at Eclipse, Inc., a Rockford, Ill., firm that has T-1 and frame relay service from Sprint. "It certainly will go into my calculations when I rewrite my term agreement."

Sprint's move officially was made in a tariff filing with the Federal Communications Commission on Jan. 6, taking effect Jan. 7. Carriers besides AT&T are permitted to make changes of this sort on one day's notice, while AT&T must give 14 days' notice. In addition, AT&T generally announces significant price moves in a press release, but Sprint does not.

The rates are based on a formula of a fixed charge per month plus a mileage component. For example, the new basic month-to-month T-1 rate is \$2,940 plus \$4.05 per mile, which comes to \$4,965 per

month for a 500-mile circuit (see graphic).

The Sprint spokesmen said other dramatic rate changes are in the works, with some rate plans being dropped, some simplified and new ones introduced.

The Sprint move comes at a time when the carrier is bidding billions of dollars on personal communications services licenses and is doggedly fighting to close two key deals — one with cable television giants for a new local service venture and one with two European carriers for global services.

The European deal, from which Sprint expects to net \$4.2 billion in new equity, is undergoing "protracted" legal proceedings, according to a Justice Department official at the recent ComNet '95 show here.

Although Sprint last week reported 1994 profits of \$862 million, it was the first time in 2 1/2 years that it did not report record quarterly earnings. With its stock price plunging, two weeks earlier, Sprint had laid off 400 people.

The private-line price move "signals that they're going to be in a high-margin business or they're not going to be in business at all," said Christine Heckart, senior consultant for TeleChoice, Inc., a consulting firm based in Verona, N.J. ☐

## US WEST places its ATM services cards on the table

BY TIM GREENE

Denver

US WEST, Inc. last week announced that it is now offering Asynchronous Transfer Mode services throughout its 14-state territory and has laid out a series of enhancements to them that are already on the drawing board.

The initial ATM offering, from the carrier's INTERPRISE group, is based on permanent virtual circuit connections at T-3 electrical and 155M bit/sec OC-3c speeds. OC-3c is direct electrical-to-optical mapping of the signal with synchronous frame scrambling.

By 1997, the carrier plans to support inter-local access and transport area ATM service, frame relay-to-ATM interworking and switched virtual circuit ATM.

Entry-level pricing for a T-3 ATM port and access link is \$1,150 per location per month. An ATM OC-3 port and access link costs \$1,500 per location per month, regardless of distance.

INTERPRISE is offering the service based on a flat-rate pricing scheme with unlimited usage. Users can lease interoffice ATM circuits at a cost of \$30 per megabit of usable bandwidth for Class A constant bit rate (CBR) traffic and \$37.50 for Class C vari-

able bit rate traffic. Discounts of up to 10% are given depending on the length of the customer contract.

That means T-3 ATM customers pay from \$1,150 to \$2,371 per month for Class A service and from \$1,150 to \$2,200 per month for Class C service.

For customers requiring ATM OC-3 Class A service, prices will range from \$1,500 to \$5,970 per month and \$1,500 to \$5,430 per month for Class C service.

INTERPRISE offers only CBR pricing for Class A service, with no provision for oversubscribing or bursting above the agreed-upon bandwidth. Class C service is designed with 20% to 30% extra capacity, to allow bursts.

Christine Heckart, senior consultant with TeleChoice, Inc., a Verona, N.J., consultancy, described the offering as "a good place to start, with reasonable prices."

"They may be able to create an ATM market where, today, none exists," Heckart said. She added that INTERPRISE's plans to support frame relay-to-ATM interworking were good but noted that some interexchange carriers plan to

offer that feature later this year. INTERPRISE should shoot for the earlier end of its third-quarter 1995 to fourth-quarter 1996 window for providing the service.

The pricing may make the service cost-effective for users reaching their T-1 capacity, who have multiple T-1 lines or are adding redundancy into their backbones.

William Anderson, vice president and manager of technical services for Seafirst

### RBOC ATM update

Company	ATM speed	Comments
Ameritech	T-1 FUNI, T-1 DXI, DS3 FUNI and OC-3c FUNI	Currently being deployed.
Bell Atlantic	DS3 and OC-3c	U.S. government, Washington, D.C. only.
BellSouth	OC-3	North Carolina state government only.
NYNEX	T-3 and OC-3	Trial marketing. No tariffed rates.
Pacific Bell	OC-3 and T-3	Available now in San Francisco, Los Angeles and Monterey, Calif., and later this quarter in Sacramento, Calif., and San Diego.
SBC	OC-3c	No tariffed offering. Will work with individual users.
US WEST	T-3 and OC-3	Currently being deployed.

DXI = Data Exchange Interface  
FUNI = Frame User Network Interface

Bank in Seattle, said the bank might use the service as an upgrade to the X.25 and frame relay services it already buys from INTERPRISE. Price will be a factor, he said. ☐



# Firm to build database for updated ISDN information

Source will detail rates, vendors and service availability.

BY TIM GREENE

Rockville, Md.

A tariff analysis firm here is compiling a database of ISDN service availability information that is scheduled to go on-line in early April.

The National Switched Digital Services Database will be updated as frequently as each week and available to users 24 hours a day via the Internet, Sprintnet and an 800 number, according to the Center for Communications Management Information (CCMI), which is

compiling the database.

It is designed for users who need frequent and detailed information about ISDN and switched 56 service availability according to area code and local exchange numbers or central office codes.

The database will allow searches by local access and transport area, state and region, as well as provide rate data and service availability dates.

Descriptions of each service offered, its marketing name, and the names and phone numbers of vendor contacts will be provided.

Commissioned by the Switched Digital Ser-

vices Applications Forum (SDSAF), the database will be supplemented by off-line availability of state, regional and national data in the form of tapes, cassettes and diskettes. Users will be able to subscribe to each of these, according to George David, publisher of CCMI.

Subscriptions for on-line services will range from \$100 to several thousand dollars per year, depending on usage.

Jesse Carter, president of SDSAFA, said he expected primary users of the service to be local exchange carriers (LEC) that act as agents for end users, interexchange carriers, consultants, systems integrators and large end users with their own communications departments. "Anyone will be able to get on and browse," Carter said.

Once the database goes on-line, users will be able to leave behind their homegrown ISDN databases, which must be compiled by making multiple phone calls to each LEC involved in a particular connection.

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## CIX

Continued from page 23

dent, the IP providers also for the first time addressed the question of regulation, determining that CIX will play a role in representing its members' interests before Congress or the Federal Communications Commission when the need arises.

"The local exchange carriers essentially have the green light from the FCC to go ahead with video dial tone," said Collet, an engineer at Sprint Corp. "Internet access could be a part of this, and we want to understand how this could impact our business and ensure fair treatment."

Just like X.25 and frame relay, IP service is not regulated by the FCC, and CIX will seek to ensure that things stay that way, Collet said.

CIX also will provide a forum for electronic commerce issues on the 'Net, said Susan Fitzgerald, the group's executive director. "We'll

do basic business analysis, such as cost per call and patterns of usage," she said.

CIX may end up playing an important role in the migration that IP providers will eventually make from the current IP, with its limited addressing scheme, to the nearly

finished IPng, also known as IPv6.

As for the controversial plan that CIX announced last August to begin filtering out nonmember traffic in November 1994, Collet admitted that nothing has happened to date.

"We still need more information from our members, and there's also a question whether we can even do this because there is no way to prevent non-CIX members from advertising their networks on the CIX router," Collet explained. □

#### Comments?

See "How to reach us" on the back page.



# CLIENT/SERVER APPLICATIONS

Distributed Databases, Messaging, Groupware, Imaging and Multimedia

## Team-oriented apps development tools make debut

BY ADAM GAFFIN

Several vendors are announcing tools aimed at making life easier for developers working in teams to build client/server applications.

Cadre Technologies, Inc. of Providence, R.I., last week announced a new tool kit aimed at speeding the development of object-oriented client/server applications. Its ObjectTeam/ProDev features graphical viewing tools that let developers see links between various application components, including components in operation across a net. The kit is now available for SunSoft, Inc.'s Solaris 2.03 Unix platforms, with a version for Hewlett-Packard Co.'s HP-UX due out in the second quarter.

Intersolv, Inc. this week will announce Version 3.0 of its Excelsior II object-oriented analysis and design tool, aimed at enterprise applications. The new version adds the ability to integrate several analysis and design methodologies in a single project, lets developers translate application designs into C++ class libraries and frameworks, and adds

Team development toolbox			
Company	Product	Price	Availability
Cadre	ObjectTeam/ProDev	\$3,150	Now
Intersolv	Excelsior II 3.0	\$4,000	Feb. 15
MKS	MKS Source Integrity 7.1	\$449	Now

an interface to Powersoft Corp.'s PowerBuilder application development tool. Version 3.0 also adds tight integration with Intersolv's other development tools, including its PVCS configuration management software. Excelsior II 3.0 comes in Windows, OS/2 and Unix versions.

Mortice Kern Systems, Inc. (MKS) of Waterloo, Ontario, next week will announce an enhanced version of its configuration management tool for team development. MKS Source Integrity 7.1 adds integration with Microsoft Corp.'s Visual C++ and Borland International, Inc.'s C++. New event triggers mean the software can notify team members when certain events happen.

MKS Source Integrity is available in DOS, OS/2, Windows, Windows NT and Unix versions. It uses an enterprise's existing file system to store application components under development.

©Cadre: (413) 351-5950; Intersolv: (301) 230-3200; MKS: (519) 884-2251.

## VMARK, Easel bond via \$25 million merger

BY BARB COLE

Westborough, Mass.

VMARK Software, Inc., a database and middleware provider based here, last week merged with Easel Corp. of Burlington, Mass., a supplier of application development tools.

The merger will provide VMARK customers with much-needed application development tools, while Easel's offerings will gain tighter integration with VMARK databases. Easel's tools already have a base level of integration with VMARK databases via Microsoft Corp.'s Open Database Connectivity technology, noted Al Cooley, Easel's director of marketing.

Under the terms of the agreement,

Easel shareholders will exchange their shares for about \$25 million worth of VMARK stock. The merger is expected to be completed in the second quarter.

VMARK, which posted revenue of about \$45 million last year, sells UniVerse, a client/server multidimensional database that runs on Unix and Microsoft Windows NT servers. Multidimensional databases can store data in several formats but often conform to standard SQL. VMARK also offers HyperStar, object-oriented middleware that lets users access several relational databases from UniVerse.

Easel, which generated revenue of about \$20 million last year, sells Object Studio, an object-oriented application

tool, and another tool for building applications that work with relational and host databases.

Analysts said the merger joins firms that operate in the relational database and object-oriented client/server technologies — areas that are bound to cross in the next few years as more companies embrace object-oriented programming.

The merger also provides a wider distribution channel for Easel's highly acclaimed but little-known tools, possibly giving them "a kick-start," said Chet Geschickter, vice president and director of research at Hurwitz Consulting, Inc. in Watertown, Mass.

©VMARK: (508) 366-3888.

bases. The gateway is based on Information Builders, Inc.'s Enterprise Data Access/SQL Release 3 middleware technology and costs \$20,000 for one to 20 users or \$50,000 for more than 21 users. Separately, Informix is shipping Informix-DCE/NET, a gateway that lets Informix On-Line database users exploit Distributed Computing Environment security and directory capabilities. It costs \$375 per user.

Informix: (415) 926-6000.

FHS International, Inc. of McLean, Va., has announced E-mail gateway software that supports Multi-purpose Internet Mail Extensions and uuencoding. The company's MBLink for SMTP/MIME provides electronic mail connectivity between Simple Mail Transfer Protocol mail systems and a variety of proprietary systems. Pricing starts at \$3,000 per gateway.

FHS: (703) 883-0220.

## Beta users give SQL Server 95 high marks

*Starfighter mgmt. tool an early favorite.*

BY BARB COLE

Redmond, Wash.

Microsoft Corp.'s SQL Server 95 is winning accolades from beta testers who said the product is unmatched in terms of ease of use and its ability to manage and replicate distributed databases.

"[Microsoft] has really done a superb job with the user interface. Setup and administration are a no-brainer," said Jerry Stets, a consultant at Stanford Business Systems, Inc. in Culver City, Calif., a systems integrator specializing in client/server. Stets is running the database at several sites and expects to build departmental applications with it for its clients.

SQL Server 95 is a Windows NT-based version of Microsoft's database designed to compete with products from Oracle Corp., Sybase, Inc. and others.

Beta testers seemed impressed with SQL Server 95's graphical administration tool, code-named Starfighter. The way it displays database server information in outline form makes it easy to see which databases and users are accessing them, they said.

Almost every aspect of SQL Server 95, such as configuration, replication and backup, can be managed from a single Windows console, according to the beta testers. Even multiple, distributed SQL Server

95 servers can be managed from a central site, they said. Administrators can install or delete databases, and determine how much space is available in each by clicking on a toolbar.

"SQL Server 95 is tightly integrated with [Windows NT], the operating system on which it runs, so system information is readily available. And since it's a relatively new product, it doesn't have the command-line legacy that older products do," said Robert Bolt, president of Database Server Systems, Inc., a consultancy based in South San Francisco.

One downside of Starfighter is that it is not expected to work with other vendors' databases.

Built-in replication, another key feature of SQL Server 95, will copy all or part of a SQL Server 95 database to another location, beta testers said.

David Sarna, chairman of ObjectSoft Corp., a software development firm in Englewood, N.J., predicted that SQL Server 95 will be "a hot product" because administrators can use Microsoft's popular and relatively simple Visual Basic programming tool instead of the complex SQL language to write stored procedures for the database. In addition, SQL Server 95's full support for OLE gives developers more programming options, he said.

"Whereas before you might program to SQL Server through a dynamic link library, with SQL Server 95, you may use anything that knows how to talk to an OLE server. So you could do it from Excel, Access or Project, or PowerBuilder," said Sarna, who is testing a beta copy as a development database for custom applications.

Microsoft has not determined exactly when SQL Server will ship. Beta testers said they still have not received an updated beta version, which was scheduled for January release. ☐



### Reality Check

**Product:** SQL Server 95  
**Company:** Microsoft

#### The benefits:

- GUI-based installation and configuration.
- Built-in replication facilities.
- Comes with SQL Monitor, which restarts the server in the event of a crash and does unattended backup.

#### The drawbacks:

- Is expected to replicate only SQL Server 95 databases in its first release.
- Runs only on Windows NT.

#### The user view:

"The strengths of SQL Server 95 are its tight integration with Windows NT, its built-in replication features and the fact that it can be completely controlled from a [Windows] desktop."

David Sarna

## BRIEFS

Trinzic Corp. of Palo Alto, Calif., has announced software aimed at giving users of Lotus Development Corp.'s Lotus Notes access to back-end databases. Trinzic's Notes-Pump will let users compose queries, which will then be submitted to the databases via Trinzic's InfoPump Notes database replication software. Users can have the data returned in spreadsheet, electronic mail or database format. Availability is expected for the second half of this year.

Trinzic: (415) 328-9595.

Informix Software, Inc. of Menlo Park, Calif., is shipping two new database gateways. The Informix Enterprise Gateway lets users access more than 60 relational and nonrelational data sources from Informix On-Line data-



## SHARED LOGIC

by Mike Rothman

# Lotus goes for the throat with new Notes pricing scheme

**L**ast weekend, I spent a snowy Sunday watching *The Ultimate Fighting Championship*, a video about a great sporting event. It pitted mar-

tial arts experts against each other — with no holds barred and no rules — in an octagon-shaped steel cage. Basically, the one who can walk out wins.

This stuff is not for the faint of heart, as the action includes lots of blood and broken bones. Although brutal, this spectacle enabled me to regain contact with my animalistic instincts without chancing a visit to my local penitentiary or putting a crimp on my career.

One thing I can say is that those guys know how to finish a fight. Once they get an opponent at a disadvantage, they go for the kill. No mercy, no second chances.

Just like Lotus Development Corp. — not. Many industry observers have wondered if Lotus has the killer instinct needed to win the groupware battle. Lotus could have snuffed out

competitors while they were incubating by dropping the price of Lotus Notes client software.

But instead, Lotus has kept Notes priced artificially high for years, letting other vendors (NW, Jan. 23, page 46) gain a foothold with lower priced collaboration products.

Not to say Lotus didn't have a plausible explanation for Notes pricing. The company maintains it was a means to control the rate of Notes adoption, so Lotus could build an adequate support infrastructure.

Once comfortable with its ability to support large Notes implementations, Lotus promised a revamped pricing scheme.

Granted, that was a well-thought-out, considerate approach. Not to mention that leaving money on the table — by pricing Notes lower — would have been repulsive to Lotus at the time.

The fact remains that Lotus had the opportunity to seed the groupware market with low-priced Notes clients and make big bucks on high-volume upgrades.

But instead, Lotus basically invited Microsoft Corp. back to the table. Microsoft wound up declining the invitation though, by not shipping its promised Exchange software.

Last month at its Lotusphere user conference, Lotus pretty much retracted the invitation anyway. The Notes trinity of Jim Manzi, Jeff Papows and Mike Zisman took off the kid gloves and applied a choke-hold to the groupware market by revamping Notes pricing.

Lotus introduced a Notes run-time version, called Notes Desktop, offering full Notes functionality without the database design functions. Listing at \$155 per user, now enterprise Notes application rollouts will not break the bank.

Lotus also reduced the list price of the full Notes version to \$295 from \$330. Should users start with Notes Desktop and need to design their own views and forms, they can easily upgrade.

As volumes skyrocket (Lotus sold 400,000 new Notes clients in the fourth quarter of 1994), Lotus should be able to continue dropping the price, presenting a fairly significant barrier to entry by potential competitors.

Add the inherent technical complexity of the product — I'm sure Microsoft can attest to the difficulties of replication — and this seems to be a one-horse race for the foreseeable future.

Is this a done deal? Of course not, I've seen vendors blow even bigger leads by getting fat and happy, and by forgetting to check the rear-view mirror. Remember how 1-2-3 for DOS dominated the market?

But I don't think Lotus will blow this one. The company seems to have learned a valuable lesson in competition and marketing from Microsoft and has gained a new lease on life from Exchange delays.



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♦ Rothman is program director for META Group's Global Networking Strategies service in Reston, Va. Feedback is welcome either by E-mail at [MikeR@metagroup.com](mailto:MikeR@metagroup.com) or by phone at (800) 622-1108, Ext. 521. Rothman's column alternates in this space with that of Marc Myers, president of Client/Server Connection, Ltd.





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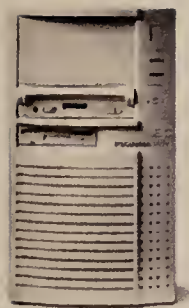


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## EDITORIAL

### Making a bundle

This week, we begin a special series (see story, page 1) examining the practice of bundling, where carriers package equipment and services in an integrated network offering.

Bundling of equipment with basic, tariffed services is still banned by the FCC. But bundling happens more and more often these days, as carriers package routers and other equipment as part of their managed LAN offerings and so-called enhanced services, such as frame relay.



Many hardware makers report that carriers are accounting for a growing chunk of their sales — a situation they view with some trepidation. While the carriers are powerful sales allies, bundling tends to reduce a manufacturer's account control and distance it from customers. Even worse, being left off a carrier's preferred-supplier list can be a big competitive blow.

But for users, there's a lot to be said for bundling. Smart customers can negotiate great pricing for an end-to-end net, and they can reduce the risk of buying into equipment that may not meet their needs in a year or two. If things change, the carrier can bring in new gear.

Customers also can bargain for management and service capabilities that fit their applications.

The sad truth is that the bundling strictures no longer apply; they were drafted when there was little real competition in telecommunications and customers didn't have the breadth of equipment options available today.

Instead of protecting customers, the bundling restrictions actually hobble them, limiting their choices and reducing their flexibility to work out custom arrangements. The restrictions assume that customers aren't savvy enough to determine what's in their best interest and have to be shielded from the realities of the marketplace. Neither is true.

If customers don't like the equipment provided by one carrier, they can turn to a competitor. While the danger of collusion exists between a particular carrier and, say, a particular router vendor, market pressure will tend to reduce that danger.

Of course, any new regulatory approach to bundling needs to ensure that customers have the option of buying unbundled services. It must also make some provision for the differences in competition at the local and long-haul levels and accommodate systems integrators, which have a hard time offering bundled nets without clear pricing information from carriers.

As Congress weighs in once again on telecommunications reform, it's clear the right regulatory approach is to give the marketplace more say in the bundling issue than the government now gets.

♦ JOHN GALLANT

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## TELETOONS

FRANK AND TROISE



## TELECOM REGULATION

by Christine Heckart

### Frame relay tariffing offers few real advantages for users

In November 1994, the Independent Data Communications Manufacturers Association, Inc. (IDCMA) filed a petition with the Federal Communications Commission requesting that AT&T be required to tariff its frame relay services. While this move would offer some benefits to users, it also would have some significant drawbacks. In the long run, users would be better off without frame relay tariffing.

A legal precedent has been established that if AT&T is required to tariff a service, so must all other common carriers. From a telecommunications user's perspective, tariffing frame relay would offer two main advantages.

First, it would allow users to compare provider offerings without having to contact each provider. Without tariffs, the only way to compare alternative carrier offerings is to accept bids from a variety of service providers, which increases the time it takes for the user to make an educated decision.

Second, users would be assured that the price they pay for frame relay is equivalent to the price every other user pays for the service.

However, frame relay tariffing would present users with an even greater number of potential disadvantages. First, to protect themselves, carriers would have to tariff frame relay at a price that would let them profitably provide service to nearly every user — even though user network requirements are far from equal. This could produce carrier rates generally higher than those prevalent in a nontariffed market.

Second, pricing in a new market is often highly uncertain and subject to rapid price declines. Tariffing in this environment can be difficult and can slow the process of rapid price adjustments, again leading to relatively higher prices.

Third, tariffing makes it more difficult for users to negotiate special pricing for their particular networking circumstances or needs.

Fourth, many frame relay services have unique features that can make comparisons between offerings difficult. Working closely with carriers ensures users that pricing will be applied correctly and questions answered directly. Relying solely on tariffs could create misinformation or misunderstanding.

Fifth, tariffing lets carriers signal one another in advance about pricing changes, which is informal collusion. The long-term result is relatively higher pricing than in a nontariffed environment.

This last point is probably the most compelling reason for the FCC to deny the IDCMA's petition. The private-line market trend of upward pricing over the last year provides evidence of informal price collusion among carriers. AT&T raises private-line rates, and the other carriers follow, keeping relative positioning unchanged.

The IDCMA's petition claims AT&T is often slow to provide price quotes to interested customers. The frame relay market is experiencing triple-digit growth, and keeping pace with all aspects of demand — from pricing quotes to new site installations — is difficult now for many carriers. It takes longer to generate a price quote for frame relay than for more basic network services because users require assistance with frame relay network design. However, if AT&T is

slow to respond to a request for pricing, the user can request a quote from an AT&T competitor instead.

The petition also states that AT&T sometimes requires users to guarantee that they will use the AT&T frame relay service if a price quote is provided. While this initially may sound unfair, it's important to consider the carrier's perspective. Carriers invest a significant amount of time and resources helping potential customers design an optimized network based on the applications and performance objectives. Therefore, it's not totally unreasonable for a carrier to ask for some level of assurance that the client won't take the design and then turn around and give its business to another provider.

If the past is any indication, tariffing seems to have little impact on user behavior and the service adoption rate. For example, when carriers began tariffing generic DS0 service at about one-third the rate of digital data service (DDS), one would have expected nearly all DDS clients to migrate to the lower cost alternative. There is no technical difference between the two — the only difference is that DDS typically has a mean time to repair objective of two hours,

while DS0 has four hours. Yet most carriers saw only minimal decline in the installed DDS base, though many new customers chose DS0 service.

In addition, a recent study of frame relay users indicates that about 80% had purchased frame relay service from their primary, incumbent provider. If this figure is even close to accurate, it is rather appalling.

Both these examples show that many users don't take the time to compare prices and service offerings; instead, they stick with the status quo. With or without tariffs, users must assume some level of responsibility for researching the best available price and performance alternatives.

The FCC's verdict regarding frame relay tariffing has implications for other services, as well. The decision made for frame relay will very likely set the precedent for Asynchronous Transfer Mode. The legal point being debated is whether or not frame relay is a value-added service; if it is, tariffing is not required.

Most carriers plan on offering a family of broadband services where protocol conversion is handled by the network. Some user locations will be frame relay, others ATM, and in the future, still others could be private-line, X.25, TCP/IP or Switched Multimegabit Data Service. The network will intelligently convert between the protocols, giving users investment protection and a smooth migration path between services. This is, indeed, in keeping with the definition of a value-added service.

With or without tariffs, users can get pricing information from carriers. However, in the end, I believe interference with the functioning of an open market, even one with a 'dominant' provider, is less efficient and less desirable than letting supply and demand regulate the market. Less red tape and bureaucracy results in lower pricing, and benefits all users and carriers. Tariffs should not be required for frame relay.

♦ Heckart is director of broadband consulting for TeleChoice, Inc., a Verona, N.J., consultancy. She can be reached at (201) 239-0700 or via MCI Mail at 445-4690.



# PRO

## Should users move their SNA and multiprotocol traffic to frame relay networks?

# CON

BY LYNN NYE

Users seeking a cost-effective, high-performance way of transporting SNA and multiprotocol traffic over WANs would be cheating themselves by not giving frame relay a serious evaluation.

Although Data Link Switching (DLSw) is the popular approach and will contribute in supporting various internetworking needs, it lacks the discipline and control SNA requires to become the de facto enterprise internetworking solution.

Over the past few years, it has become clear that tunneling — either through IP or some other fashion — is not the best method for sending SNA and Synchronous Data Link Control (SDLC) traffic across a WAN. As a result, other techniques have been investigated to meet the challenge.

During this time, a foundation was laid for what will prove to be the leading solution for SNA internetworking over the WAN: frame relay. New implementations of SNA over frame relay, based on RFC 1490 (a standards document that defines the transport mechanisms for a wide set of protocols over frame relay), deliver the services that are required in SNA networks while facilitating bridging and routing requirements for client/server systems.

SNA end users are accustomed to a very high level of service, which is the trademark of SNA networking. SNA's DLC layer makes this level of service possible. In an SNA network, this link service is facilitated through either SDLC (for serial lines) or Logical Link Control 2 (LLC2) (for token ring and now frame relay), which are classified as connection-oriented protocols.

The critical role that link-layer services play in the network's overall performance is why IBM based its implementation of SNA over frame relay on the RFC 1490 standard. This specification calls for the use of LLC2 over frame relay to transport SNA traffic, including subarea and Advanced Peer-to-Peer Networking traffic. With LLC2 taking responsibility for the delivery of the data over the frame relay network, the end user is ensured of rapid response times.



But where do I come off saying that LLC2 over frame relay is the way to go, when everyone knows that DLSw already took care of this problem?

First of all, DLSw is a very important technology and will have a lasting role in providing internetworking solutions. The most significant objective of the DLSw architecture was to develop a scheme for supporting link-level services across an IP-router infrastructure.

This provided a means to support two dominant application environments within an IBM enterprise: SNA (SDLC or LLC2) and NETBIOS (LLC2).

The DLSw standard addresses many technical complications that have always plagued routers in their quest to support these link-level services. However, the architectural burden that TCP/IP places on SNA keeps DLSw on the sideline as a good standard, but as a runner-up solution for SNA internetworking.

Remember, the link-layer services that LLC2 delivers to SNA are the foundation for SNA's well-earned reputation for reliability. So allowing link-layer services to be handled by something other than LLC2, such as DLSw, must be done in a way that does not tarnish SNA's reputation.

That very issue is what makes the integration of IP-bound services such as DLSw a difficult objective. Although DLSw addresses the functional operations of SDLC and LLC2, such as the status of your transmission partner, flow control, error recovery and sequencing, DLSw's underlying dependency on IP for networking between switches (routers) makes it nearly impossible to establish a deterministic level of service across the entire enterprise.

So don't compromise your SNA internetworking solution by removing the foundation of its well-earned reputation, the DLC layer. The performance monitoring function of LLC2 in a frame relay network ensures a level of service that cannot be matched with a TCP/IP solution.

♦ Nye is president of NetResults, a consultancy in Portland, Ore., and an organizer of the RFC 1490 Group. He can be reached by phone at (503) 788-1771 or via the Internet at 71334.1270@compuserve.com.

BY LOUISE HERNDON WELLS

Data Link Switching (DLSw) is rapidly becoming the preferred solution for carrying SNA and NETBIOS traffic across wide-area networks in many user environments. It offers key advantages over its main competitor, the Frame Relay Forum multiprotocol implementation agreement 3 (FRF-3) SNA supplement to RFC 1490.

RFC 1490 is a specification that defines how multiprotocol traffic flows over frame relay links. Although RFC 1490 is usually thought of as supporting SNA, the RFC 1490 specification actually mentions neither SNA nor Synchronous Data Link Control. It is FRF-3 that describes how to implement RFC 1490 encapsulation for SNA. For ease of discussion, however, I'll use the term RFC 1490 here to include FRF-3.

For user companies that have both SNA and non-SNA traffic at a number of remote offices, both DLSw and RFC 1490 provide valuable solutions. Furthermore, SNA customers can rest assured that IBM supports both. However, DLSw offers advantages in several types of environments.



For example, DLSw is a better solution for organizations that already use routers, especially those using routers primarily for TCP/IP. While RFC 1490 is limited to frame relay links and point-to-point connections, DLSw runs over the plethora of links supported by IP. In addition, most multiprotocol routers usually also support Novell, Inc.'s IPX and other protocols, either natively or encapsulated within TCP/IP, on the same network. While RFC 1490 is written to support a variety of protocols, currently most frame relay vendors have implemented only a few of these in their products.

Routers with DLSw can find each other automatically, and routes are dynamically generated. Frame relay circuits, however, require more pre-configuration. Furthermore, solutions based on RFC 1490 don't support IPX or IP routing across the frame relay network, so this traffic appears bridged.

DLSw is a more natural fit for complex SNA and TCP/IP environments for several reasons. First, since DLSw uses TCP/IP, network traffic can automatically reroute around failed links. Not all frame relay switches provide alternate path routing.

Second, DLSw terminates the data link connection, avoiding timeouts, which are more likely to occur over a WAN. Technically, a frame relay access device could be designed to locally terminate the data link, but most vendors do not implement this feature.

Third, DLSw terminates the token-ring routing information field, extending its seven-hop limit to seven hops on either side of the WAN. With frame relay, however, the path is limited to seven hops from end to end, with the frame relay network appearing as one hop.

In terms of hardware cost, although a stand-alone frame relay access device is inexpensive, it is not significantly cheaper than a low-end router supporting DLSw and many other protocols and features. Another potential cost advantage of frame relay technology — the ability to carry several protocols on different Data Link Control Interfaces (DLCI) over one link — has been mitigated by the service providers, which tariff frame relay by DLCI rather than by link.

In conclusion, DLSw offers key benefits over RFC 1490 with FRF-3, particularly for companies integrating SNA and IP traffic. However, since both technologies have many advantages, it is beneficial that many vendors implement both protocols in a single box, allowing a customer to switch if conditions change. Further, the technologies are not mutually exclusive: A company may find it is best served by using DLSw in some parts of the network and RFC 1490 in others.

♦ Wells is director of IBM internetworking at Internetwork Technology Institute, a Milpitas, Calif., consultancy, and is chair of the Data Link Switching Related Interest Group. She can be reached by phone at (408) 946-4625 or via the Internet at lhewells@cup.portal.com.

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The In-box has moved this week to page 40.



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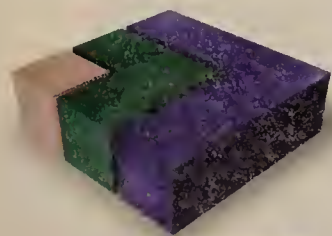
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# Review

## SNMP

# scaffolding

By Todd Coopee

**HP OpenView Network Node Manager helps administrators build a solid enterprise management framework.**



**H**P OpenView Network Node Manager 3.3, the latest net management release from Hewlett-Packard Co., is designed to allow network administrators to map and monitor large, complex networks from one or more Unix workstations.

However, like most SNMP management stations, OpenView Network Node Manager is not a complete enterprise network management solution out of the box. It lacks the comprehensive set of tools necessary to administer the host of third-party peripherals prevalent on most LANs and WANs. Instead, it provides a framework for other network management applications to build on. Some of the add-ons cost nearly as much as Network Node Manager itself.

For its \$15,750 high-end price tag, we expected Network Node Manager to dazzle us with its network management prowess. For the most part, we were not disappointed, although we found the installation and configuration process to be a bit abstruse and the documentation to be somewhat light on information in places.

Overall, Network Node Manager provides a powerful and easy-to-use set of basic network monitoring facilities. Its only real shortcoming is that it is expensive and requires a fair amount of tailoring by individual site administrators.

Fortunately, there are more than 70 third-party products available.

Depending on your network topology and management desires, these additional product costs can add up very quickly. With a recent surge in new third-party add-ons, Network Node Manager has amassed slightly more third-party support than its two closest competitors — Sun Microsystems, Inc.'s SunNet Manager and IBM's NetView/6000.

The level of third-party support for all three products remains strong.

Incidentally, the level of integration

into Network Node Manager varies greatly among third-party products. Some are tightly integrated and take advantage of facilities already available within Network Node Manager, while others simply use it as a front end to launch an entirely different application.

Currently, Network Node Manager 3.3 operates on HP 9000 series workstations running HP-UX 8.0.7 to 9.0.4 or any Unix workstation with a scalable processor architecture (SPARC) chip running SunOS 4.1.2 or Solaris 2.3 or higher. Regardless of the workstation type, plan on equipping it with a fairly substantial amount of memory (32M bytes or greater).

HP recommends that a least 65M bytes of free disk space be available to allocate to the product. This is a bare minimum. We advise doubling or tripling the allocation to allow for exported data files, image snapshots and additional software.

In addition to providing sufficient disk space, the Installation Guide indicated that semaphores must be enabled in a system's kernel. Semaphores are operating system primitives that synchronize system resources. Among other things, Network Node Manager uses them to ensure that it isn't writing to the same data structures at the same time. Here is where we ran into some minor problems.

To check whether our system currently supported semaphores, the installation notes recommended using the `ipcs` command. The command output displayed a message indicating that the semaphore facility was not in our system. Following the instructions, we then rebooted the machine and rebuilt the operating system kernel. Unfortunately, the `ipcs` command indicated that the semaphores still were not enabled. We again rebuilt the kernel and still had no luck.

A call to technical support revealed that the `ipcs` command is a notoriously poor indicator of system facilities and that most likely, semaphores were enabled on our host. We were told to

ignore the message and continue with the installation. We believe HP should consider amending the installation notes to include this caveat or provide an alternate means to verify active semaphore support.

Administrators must obtain a software activation key from HP in order for Network Node Manager to operate. To get one, we faxed a software certificate containing, among other things, the host name and IP address of our system. We received a valid key by return fax within four hours. HP indicated that it typically completes the process within one business day.

Sites with a multihost license receive individual keys for each host/IP combination. Since each key is based on both the IP address and host name, changing either of these means you'll need a new key.

While faxing a software certificate is by no means an inconvenience, we believe HP should also provide the option of receiving a certificate via electronic mail.

The rest of the installation ran without a hitch. We extracted the file set containing a number of installation programs, installed the activation key and used the `ovinstall` program to install the SNMP Management Platform and Network Node Manager. In addition to the time spent tracking down the answer to the semaphore question, the entire installation took less than 30 minutes. While `ovinstall` is simple enough to use, it would be nice if HP also allowed users to employ `pkgadd`, the standard software installation tool built into Solaris, as an alternative.

Besides setting up a management console, we also installed the HP OpenView Simple Network Management Protocol Agent software on a subset of the other workstations on our network. While it is not imperative to install agents on all remote workstations, doing so increases management functionality and provides greater and more detailed information.

### MAPPING AND MONITORING

Administrators start Network Node Manager by opening the OpenView Windows graphical user interface, `ovw`. Once invoked, `ovw` kicks off two additional

applications, `ipmap` and `xnmevents`, which facilitate data collection, information storage and monitoring of network objects from the management console.

When launched, `ipmap` initiates a full-scale search for all IP-addressable nodes on the network. It creates an object entry for each discovered node and generates a graphical representation of the node from a built-in library of icons. `Ipmap` uses two background processes to discover and update the map. The network monitor process (`netmon`) discovers existing network devices, such as routers, hubs, bridges, hosts and terminal servers, that are SNMP-savvy by polling them.

In addition, the IP Topology Manager process, `ovtopmd`, maintains the integrity of the data in the corresponding topology database.

In general, `ipmap` maps objects in a hierarchical fashion, creating a series of submaps that display the network in increasing detail. At the top level, the internet submap displays all of the logi-

**Continued on page 34**

## Result

### Product:

HP OpenView Network Node Manager 3.3

### Key findings:

- ▶ Hierarchical submaps display the network in increasing detail.
- ▶ Network maps are customizable.
- ▶ Integrated monitoring and logging features can be applied to groups of objects.
- ▶ Internet mailing list provides useful information.

### Platforms:

- ▶ HP 9000 series
- ▶ SPARC workstations

### Requirements:

- ▶ HP-UX 8.0.7 to 9.0.4, Solaris 2.3 or higher, or SunOS 4.1.2
- ▶ 65M bytes of disk space
- ▶ Large disk partition
- ▶ Color monitor recommended

### Vendor:

Hewlett-Packard  
3404 E. Harmony Road  
Fort Collins, Colo. 80525  
(800) 637-7740

### Price:

\$15,750

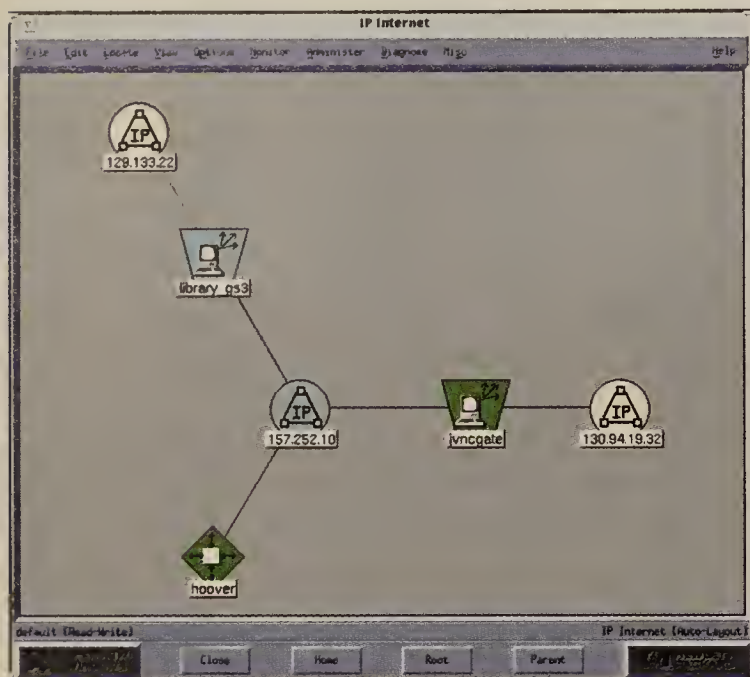


Continued from page 33

cal partitions of IP networks and their corresponding gateways (see Figure 1). Double-clicking on any network symbol brings up a representative network submap. This map displays the physical partitioning of the network down to the segment level, as well as any routers, hubs and bridges attached to the segments. Imap also tries to display the physical topology of each segment on the map, illustrating nodes in a token ring, star, Fiber Distributed Data Interface ring or simple linear bus whenever possible.

Opening an individual segment brings up a segment submap that displays all of the hosts and communications devices appearing on that leg of the network. Finally, clicking on a single node displays all of the components of the node, such as interfaces and controller cards.

Once an initial set of maps and a database



**Figure 1: Network Node Manager's internet submap displays all of the logical partitions of IP networks and any associated gateways. Selecting a specific net brings up another submap with greater detail.**

has been created, ipmap uses netmon and ovtomd to detect new elements that appear on the network and are not yet reflected in the run-time database.

By default, ipmap does not try to discover every node on the LAN. Instead, it only maps the network segments to which the management console is connected. Ultimately, the depth and breadth of network searches can be determined by editing a local configuration file or interactively expanding the number of regions searched by ipmap. For our tests, we configured ipmap to discover and map all the

objects in the segment containing our management console and then had ipmap build a map of all the objects in the entire domain.

We were impressed with the results. In both tests, the ipmap application had no trouble locating all the nodes in the subnets we had it search. It also did a remarkably good job at distinguishing the class of object it was polling. For the most part, workstations, routers, personal computers and minicomputers were identified correctly. We rebuilt the maps several times, with the results being virtually the same.

The response rate of our management console was also nothing to sneeze at. Shortly after initiating a new map request, our screen was filled with a dizzying array of nodes and submaps. Soon thereafter, the discovery process was complete and provided us with multiple submaps depicting our network topology.

Network Node Manager gives you considerable latitude to fine-tune network maps to enhance readability and accuracy. You can customize icons, cut and paste elements between submap hierarchies, and apply background graphics to individual submaps. Some of these features are not as well documented as they could be, however, so expect to spend some time filing through the on-line documentation to find what you're looking for.

#### NET CONTROL

With an accurate set of network submaps in hand, we turned our attention toward the proactive monitoring of network objects and collecting usage data for capacity planning purposes. In Network Node Manager, the monitoring and logging capabilities are integrated

and can apply to individual nodes or to an entire network submap.

To establish continuous monitoring of a map object or an entire submap, an administrator simply selects an SNMP Management Information Base (MIB) variable with the mouse and indicates whether it should be logged to a data file, checked against a predetermined threshold or both. For example, the packet collision rate on a particular group of communications devices could be tracked on an hourly basis over a 30-day period.

One powerful feature of Network Node

Manager is its support for wild cards when specifying which network objects should be polled for data collection. This feature makes it easy to add new nodes into the monitoring mix or to stop a node from being polled, either temporarily or permanently.

Besides allowing you to create your own requests, Network Node Manager comes equipped with a number of predefined requests. These built-in programs can provide useful information quickly, without requiring you to get caught up in the syntax and semantics of building them yourself.

We started several predefined data requests and had Network Node Manager pinging hosts for availability, displaying system information and measuring IP connectivity.

We also used the Event Configuration and Application Builder tools to let us know when some of the critical statistics on a group of bridges and routers exceeded typical thresholds. Each time a threshold was exceeded, Network Node Manager notified us by changing the color of the icon wherever it appeared on the network submap.

To help administrators keep track of the status of all the MIB variables, Network Node Manager lists them all in a single table. This makes it easy to see which systems are being monitored, the rate at which information is being accumulated and which threshold levels are being applied.

#### GRAPHICAL ANALYSIS

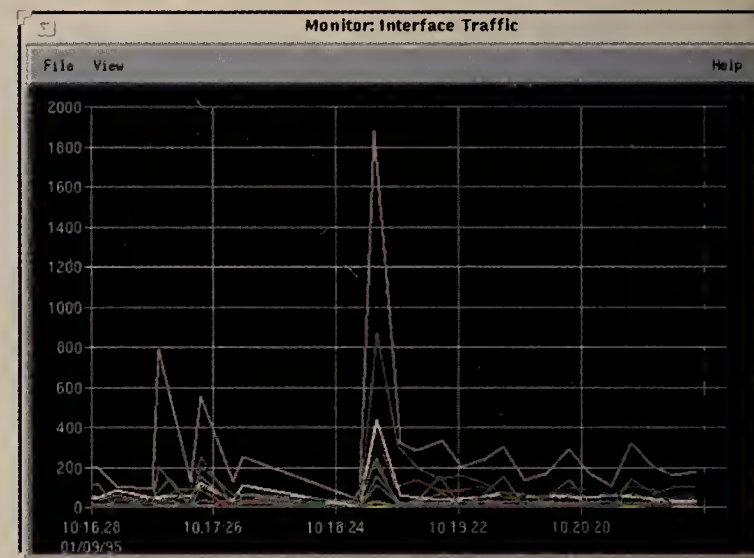
Once information has been collected and stored in log files, it can be displayed in a graph (see Figure 2). The graphing capabilities of Network Node Manager are not spectacular but are very easy to use. To form a graph, an administrator simply selects a data point and clicks on the graph button. A number of preformulated graphs are also available. They can be used to display a number of common MIB variables, such as throughput and error rates, simultaneously.

In addition to using archived data, graphs can also be generated using data received in real time. In this format, current statistical trends are quickly visible.

Because Network Node Manager is such a high-end product, reading the documentation is a must. While the printed manuals are well written, they are not nearly as thorough as they could be. Fortunately, the on-line help often picks up where the written manuals leave off.

For those with Internet access, an OpenView mailing list also exists. Internetworked users can subscribe to hp-nodemgr by sending E-mail to majordomo@rrz.uni-koeln.de. Be sure to include the line "subscribe hp-

Line	Minimum	Average	Maximum	Last Value
hoover: Packets Received, Ethernet1	0.64	5.47	35.93	1.35
hoover: Packets Received, Ethernet2	4.88	52.84	232.96	57.71
hoover: Packets Received, Ethernet3	0.20	1.48	7.52	1.11
hoover: Packets Received, Ethernet4	1.28	18.27	114.24	12.60
hoover: Packets Received, Ethernet5	8.78	74.25	437.49	34.12
hoover: Packets Received, Ethernet6	5.43	41.06	155.66	27.98
hoover: Packets Received, Ethernet7	0.02	0.13	0.71	0.09
hoover: Packets Received, Ethernet8	0.35	4.04	31.25	6.03
hoover: Packets Received, Ethernet9	0.07	0.51	5.43	0.60
hoover: Packets Received, Fddi0	42.19	305.84	1877.58	183.42
hoover: Packets Received, Ethernet10	0.00	0.12	0.66	0.00
hoover: Errors Received, Ethernet1	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet2	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet3	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet4	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet5	0.00	0.46	2.48	0.00
hoover: Errors Received, Ethernet6	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet7	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet8	0.00	0.00	0.00	0.00
hoover: Errors Received, Ethernet9	0.00	0.00	0.00	0.00
hoover: Errors Received, Fddi0	0.00	0.00	0.00	0.00
hoover: Packets Transmitted, Ethernet1	5.13	122.45	869.42	33.39
hoover: Packets Transmitted, Ethernet2	0.15	3.00	26.63	1.12
hoover: Packets Transmitted, Ethernet3	3.45	81.08	246.01	107.26



**Figure 2: Network Node Manager's built-in monitoring and graphing capabilities allow users to display MIB variables utilizing data received in real time. The data on the top can be viewed graphically, as shown on the bottom.**

nodemgr" in the body of the message. We signed up for the mailing list and found it active and moderately useful.

For sites that have large networks with a number of routers and bridges, Network Node Manager is an excellent choice. It is efficient and nonintrusive, and for those sites willing to put in the time it takes to set it up properly, Network Node Manager eliminates the need to manually check network objects for throughput and reliability. □



The alliance is a cooperative of users, consultants, educators and integrators that

applies its technical and business skills to analyze and compare strategic network products. A list of alliance partners can be found on page 31.

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## HOW WE did it

We installed and tested HP OpenView Network Node Manager 3.3 on a SPARCstation 5 running Solaris 2.3. The workstation was equipped with 32M bytes of memory and a 1G-byte disk drive. The network used for testing purposes comprised more than 800 nodes, ranging from Digital VAX minicomputers running VMS to workstations running various flavors of Unix to routers and bridges with SNMP agents installed.

Once the product was installed on our management console, we built several network maps, including a map of all the objects in our entire domain. With the maps in hand, we fired off several predefined monitoring requests and had Network Node Manager ping hosts for availability and measure network traffic through our mission-critical routers. We logged data for graphing purposes and set thresholds so we could be notified if a host was unavailable or network traffic was exceeding acceptable levels.



## Windows Connectivity Forum

# Inside the Windows 95 Communications Driver

One of the more intriguing components of Microsoft Corp.'s upcoming Windows 95 product is the operating system's Communications Driver, which manages the use of asynchronous personal computer ports. To get a feel for what the driver will mean for Windows net managers, I last week interviewed Henry Black, an independent software developer based in Half Moon Bay, Calif., and a technical associate on the WINCON Forum. Black can be reached on WINCON or by sending electronic mail to 73553.3500@CompuServe.com.

**We can discuss Windows 95's data communications capabilities now that Microsoft has relaxed its nondisclosure agreements, can't we?**

Yes. However, Windows 95 is not finalized, and Comm Drivers are once again the poor relation — they are still changing.

**The history of Windows Communications Drivers has been one wrought with problems. How come?**

A lot of the problems were caused by the PC serial port being used to connect a variety of devices — not just modems, but also the mouse, a printer or two, and even other PCs. Sharing of UART hardware between DOS and Windows applications, and the use of nonstandard Communications Driver hardware complicated matters further. But now we have [the Telephony Application Program Interface].

### How does TAPI apply?

It applies to modems and other telephone-related devices. TAPI provides a sound framework for Windows 95-aware applications to coexist and cooperate. For example, an incoming telephone call could be handed off by a data application to a fax application after it was determined that the caller is a fax machine. Previously, you had

to buy a combined application from a single vendor — if you had a fax program you liked and a bulletin board program from another supplier, you couldn't share an incoming phone line between them. In Windows 95, TAPI supports multiple port drivers for both UARTs and intelligent I/O boards, including those supporting ISDN devices.

**By Joel Diamond**  
**Technical director**

**WUGNET**

**Windows User Group Network**

76702.1023@CompuServe.com

**How many Communications Ports does Windows 95**

**theoretically support, and what are the barriers in getting technology providers to support multiple port solutions under Windows 95?**

Windows 95 supports over 100 possible Comm Ports, but still, everyone wants their port to be COM1, 2, 3 or 4. These ports are the hardest to implement because DOS and BIOS know about them, too.

Windows 95 does provide for multiple port drivers for varying hardware, but there has been little opportunity for the various suppliers to test for peaceful coexistence with one another (and little incentive to achieve it). Thank goodness new 32-bit applications and hardware interfaces are coming that can take advantage of the multiple Comm Ports and advanced applications, such as videoconferencing and World-Wide Web browsers.

## CompuServe®

To participate on the Windows Connectivity Forum, type **Go Wincon** at any ! prompt on CompuServe. For those of you who are not CompuServe subscribers, *Network World* and the Windows Users Group Network are offering a free membership sign-up by calling (800) 524-3388. Ask for Operator 426.

inant chunk of the market," Duke said.

But Dave Anderson, net manager at Canon Computer Systems, Inc. in Costa Mesa, Calif., is beta-testing the MultiGate Switch and said he likes the fact that NRC is not one of the big vendors.

"I called up NRC and explained that we had a bandwidth crisis, and NRC had the product shipped the very next day," he said. "I could never dream of getting that kind of service [from my router vendor, Cisco]."

Anderson said NRC plans to sign OEM deals with larger players, including UB Networks, Inc., but NRC declined to comment.

Pricing for the MultiGate Switch starts at \$7,995. Single Ethernet port modules for 10Base2 and 10Base-T cost \$195, and 10Base-F modules cost \$395. All are available now.

©NRC: (408) 383-9300.

Time's  
running out  
on companies  
that tell you  
they  
have  
great prices  
but won't tell you  
what  
they  
are.

On  
February 13,  
find  
out  
more.

## NRC

Continued from page 19

The MultiGate Switch can be used as hub of hubs by attaching 10Base-T workgroup hubs to some of the ports, and power users and servers to others. It could also be used as a high-performance workgroup switch to deliver dedicated 10M bit/sec to each workstation.

According to Jeremy Duke, senior analyst at In-Stat, Inc. in Scottsdale, Ariz., it will be difficult for NRC to go up against internetworking giants like 3Com Corp., Bay Networks, Inc. and Cisco Systems, Inc., which will also offer LAN switches.

"A small vendor could probably feed off the scraps that the big guys leave behind, but there's no way that [NRC] is going to get a dom-



## Beware of frame relay gotchas

By Christine Heckart

**F**rame relay is no longer the new kid on the block, having enjoyed quite a bit of success in the last three years. Yet despite its longevity, many of you may be surprised, or more likely annoyed, when unforeseen issues complicate your initial implementation and adversely affect network performance.

The sad fact is that frame relay still has a number of gotchas lurking under the covers to derail any implementation if you are not prepared for them. Seemingly straightforward issues, such as your protocol choices, may have far-reaching effects on network performance. And for users supporting different traffic types, such as LAN and Systems Network Architecture data, you need to be prepared for the consequences of which integration method you choose.

But before you start to sour on frame relay, take heart. There are suitable workarounds for any of the issues you may encounter. The trick is to be prepared for the gotchas before they affect net performance. In the following sections, we explore some of the more common obstacles you are likely to encounter and offer advice on how to minimize their impact.

### AVOIDING THE SPLIT HORIZON

One issue you should be prepared to deal with is the so-called split horizon.

Since routers in a leased-line environment have one physical port associated with each leased line, vendors adopted a rule they called "split horizon." The default configuration with leased lines is to enable split horizon, which prohibits an incoming packet from being placed on the same network interface from which it was received. Enabling split horizon prevents data from bouncing back and forth across the network in a big routing loop when a link between two sites fails.

Enabling split horizon makes perfect sense in a private-line network but not in a frame relay network. In a frame relay network, a single physical interface is used to support many remote connections. If a partial mesh network of permanent vir-

tual circuits (PVC) is used, then a frame has to be able to be sent back out on the same physical port over which it was received, just on a different PVC — such as a Data Link Connection Identifier (DLCI). Yet the possible creation of routing loops must still be avoided.

For users that plan to employ a public frame relay service with a partial mesh of PVCs and want optimal routing, the solution is a virtual WAN connection. The router vendors developed the concept of virtual WAN connections to allow routers to treat each DLCI as though it were a leased line, recognizing each independently. Routers supporting this capability will send a frame back through the same physical port over which it was received but will not allow an incoming frame to be sent back through the same PVC/DLCI over which it was received.

### PROTOCOL PRIORITIZATION

If you think keeping an eye out for a split horizon is a problem, consider that you also need to pay close attention to traffic priorities.

One of the major benefits of frame relay is its ability to handle multiprotocol environments. Most corporate networks have several different business applications, some of which are relatively more important than others. New users of frame relay may not realize that they need to prioritize their wide-area applications to optimize network price and performance.

Most router vendors today support one or more alternatives for prioritization of traffic. Keep in mind that the router has a serial interface into the WAN. This means multiple frames are not transmitted simultaneously but are transmitted in a serial fashion at the speed of the port connection. Therefore, mission-critical transactions that require rapid response times should be prioritized above other traffic-like LAN file transfers that are not mission-critical and are not as sensitive to response time.

There are several ways to prioritize traffic. One method is priority queuing. Depending on the router vendor, differing priority levels may be assigned by a com-

**So you're ready to make the jump to frame relay? Well, you might want to consider the common pitfalls and how best to avoid them.**

bination of protocol choice, TCP/IP port number and packet size. The number of priority levels varies somewhat by vendor. For example, Bay Networks, Inc. (formerly Wellfleet) routers offer high-, medium- and low- priority queues, and Cisco Systems, Inc. offers high-, medium-, normal- and low-priority options.

In the case of these vendors, the buffers associated with each queue are user-configurable. The high-priority queue might have a buffer of 20 packets; the medium, 40 packets; the normal, 60 packets; and the lowest, 80 packets. Routers will empty the waiting packets in the high-priority queue before moving on to the next queue and then empty it, and so on. The only way a lower priority packet would be sent is if there is no other higher priority traffic in the queue. A slightly more sophisticated implementation allows you to set up a minimum level of output for each queue so low-priority queues are sampled even when the higher priority queues are continually full. This may prevent low-priority applications to keep from timing out.

When implementing this type of prioritization, you should be sensitive to how the higher level application protocols will respond if acknowledgement delays are incurred. Also, you would be wise to consider the average and peak traffic loads for each priority queue. If the buffers overflow, packets will be discarded and retransmission will need to occur. What may happen is the end-to-end session management algorithm may resend the data, contributing to congestion.

In addition to priority queues, the discard eligibility bit can be controlled by the user, providing another mechanism for prioritizing traffic. The Discard Eligible (DE) bit is a binary bit that resides in the packet header as a 0 or 1; in the event the bit is set to 0, it will not allow the frame to be discarded. Setting the DE bit would

typically be done in conjunction with priority queuing. Many routers allow the DE bit to be set to indicate discard eligibility if that packet is within a low-priority queue or in any queue but the high-priority queue. The reason for doing this is that when the router has a lot of data to transmit to the frame relay network, the high-priority traffic will be counted toward the committed information rate (CIR) level, while the lower priority traffic will already have the DE bit set when it arrives at the frame relay switch. The switch will treat DE-marked packets as burst traffic, increasing the probability that all the high-priority traffic will be sent through the net as non-



discard-eligible. The result is that the high-priority traffic has a greater likelihood of getting through the network without being discarded, even during peak traffic periods, since it is more likely to be within the CIR.

#### Update-only routing protocols

Network-level protocol	Update-only routing protocol choices
IP	OSPF, IS-IS, EIGRP
IPX	EIGRP, NLSP
AppleTalk	AURP, EIGRP
OSI	IS-IS
DECnet	IS-IS
AURP = AppleTalk Update-based Routing Protocol	

SOURCE: TELECHOICE, VERONA, N.J.

Prioritization can be used alone or with logically separate PVCs as a mechanism to ensure that mission-critical traffic is delivered across the net in a timely and reliable manner. One of the biggest keys in implementing prioritization is knowing the relative priority of different applications, protocols and users. For example, some of the transaction traffic could be SNA data delivered to a token-ring LAN interface to the router, while other mission-critical transactions could be hiding in TCP/IP-encapsulated telnet packets.

Also, prioritization within the router is only one part of the answer. The router interfaces with the carrier's frame relay service, which is another area of potential traffic congestion. This is why setting the DE bit in conjunction with using priority queues can be advantageous.

#### IMPACT OF ROUTING PROTOCOLS

Your work with protocols is by no means over. The method in which routers exchange status and address information can have a significant effect on network design and network performance. One purpose of exchanging this information is so the router can select the best available path on which to route individual frames for transmission.

There are two ways to categorize routing protocols. The first category for protocols is based on the method the router uses to select the optimal route through the net. The main types of routing protocols are distance vector, distributed update algorithm (DUAL) and link state. The second protocol category is based on the method by which, and how often, the routers exchange routing table information. In this category are the traditional periodic and the newer update-only routing protocols.

Distance-vector protocols, such as the Routing Information Protocol (RIP), use a hop count to determine the best available path. The path with the fewest number of intermediate hops is chosen. DUAL routing protocols are a sophisticated version of distance vector protocols, having internal metrics that allow the router to consider cost information, much like link-state protocols.

The most popular link-state routing protocol is Open Shortest Path First (OSPF), which is often referred to as the successor of RIP. Link-state protocols look at many metric factors in determining the most direct, open path to an end destination. Distance vector and DUAL protocols don't keep a comprehensive view of every connection in the network, while link-state protocols keep a complete real-time picture of every route. Link state relates back to the amount of congestion and overhead on the net by exchanging information with the routers. That is, a link-state protocol creates a lot of

chatter, whereas other protocols only send routing updates to minimize traffic congestion.

Routing updates refer to how often and by what means routers routinely exchange information. Obviously, you don't want networks congested with routing table updates. Yet the updates provide the most recent view of the network topology, including any PVCs — such as DLCIs — or local loops that might be temporarily unavailable, or newly added or deleted PVCs. Since the status of the network doesn't change too often, there is a trade-off between real-time status updates and the amount of extra net traffic.

In large nets, performance problems can result when a large number of DLCIs are supported by one or more routers, especially if a periodic routing algorithm is used. Some periodic routing protocols include RIP and Novell, Inc.'s Service Advertisement Protocol (SAP); SAPs announce to other network servers the services offered by the broadcasting host.

When a router using a periodic routing protocol updates the other routers to which it is connected, it replicates its own routing table and transmits a copy over each DLCI. If your frame relay network has lots of DLCIs, you can expect lots of traffic on the local loop and lots of packets in the interface buffers. The traffic is of a high priority because network instability could result if the data is lost or damaged.

A high volume of broadcasts can impact traffic flows. Some periodic routing protocols broadcast a full route table update every 30 or

Continued on page 38

## Book guides frame relay users

If you're mulling over implementation of a frame relay network or need a sound primer on the topic, you might want to check out *The Guide to Frame Relay Networking: How to Evaluate, Implement and Maintain a Frame Network*.

The book is by Christine Heckart, former manager of broadband services at WilTel and now director of broadband at TeleChoice, Inc., a telecommunications industry consulting firm.

The book presents readers with a view of all the components of a frame relay network, including the equipment and service elements, and the many steps required to put together an enterprise frame relay network. Particular focus is given to making apples-to-apples comparisons between different vendor and carrier terms, and various approaches to service, pricing and management.

Most importantly, it dedicates two chapters to network design tips and even walks the reader through a comprehensive network design example. Alternative access solutions are explored, as are advanced network designs, using dual-homing configurations and parallel permanent virtual circuits for LAN and Systems Network Architecture traffic.

The Guide to Frame Relay Networking is published by Flatiron Publishing, Inc. and costs \$34.95. It can be ordered by calling 1-800-LIBRARY or by contacting TeleChoice at (201) 239-0700.

BY CHARLES BRUNO

If you're  
**sick**  
of hearing  
the  
word  
“access”  
without knowing  
what  
it means,  
you're in  
good  
company.  
On  
February 13,  
I find out  
who  
that company is.



Continued from page 37

60 seconds over each DLCI. The bytes per routing table entry could range from four to 16 depending on the routing protocol. SAPs might approximate 85 bytes per table entry. Each complete update must be sent over each DLCI. Again, in large networks this creates congestion problems.

An alternative to sending a full copy of the route table periodically is to send only the updates, or changes, to the tables on a required basis. This update-only approach significantly reduces the amount of broadcast traffic on the network. OSPF, the Enhanced Interior Gateway Routing Protocol (EIGRP), Novell's NetWare Link Services Protocol (NLSP), the Border Gateway Protocol and Intermediate System to Intermediate System are a few protocols that support this update-only approach.

Update-only protocols send a keep-alive signal between routers about every 10 seconds. Changes in the routing information are broadcast as they occur. And every 30 minutes or so, the router broadcasts a full update.

Some router vendors have implemented a special queue in the router with its own buffer for broadcast traffic such as routing and SAP updates. This allows the router to handle broadcast updates separate from user data.

As a general rule of thumb, update traffic should be kept at 20% or less of the access link speed. The bigger the network and the slower the connection speeds, the more of an impact routing updates and broadcast traffic will have on overall net performance. Intelligent update-only protocols, such as DUAL or link state, should be used in large multiprotocol networks, especially if transmission rates are low.

## THE NOVELL CURVE

Novell's NetWare is the most widely implemented LAN architecture and network protocol, with an estimated 70% of internetworks supporting at least some IPX traffic. There is a long and painful story about routing IPX over a WAN. Whether the network consisted of private lines, X.25, frame relay or "cup-and-strings," IPX made little discrimination. It performed horribly over them all.

Basically, IPX was not initially intended for low-speed WAN connections or the relatively

long response times that these connections provide; even at the speed of light, there is measurable propagation delay over the fiber in traveling cross-country. IPX was designed to operate over very high-speed local connections. Since it was designed for the local environment, IPX required one acknowledgement packet per transmitted packet. Over the WAN, this causes severe throughput limitations.

The good news is that the problem has been overcome by software upgrades Novell implemented as Network Loadable Modules (NLM), which the firm has released for NetWare 3.11.

The first upgrade, and the one that most directly impacts wide-area networking, is called Packet Burst Mode, or P-Burst. This gives IPX a dynamically adjusted sliding window for sending and receiving packets and acknowledgments. With the upgrade, IPX can send several packets for transmission before expecting to see an acknowledgement. This significantly reduces the excessive overhead that would otherwise ping-pong between client and server, reducing net performance.

Novell also released an upgrade that lets net administrators increase the maximum packet size. Large packets may be better suited to local and campus environments as opposed to WANs, although there are different views on this topic. The default packet size of 512K bytes works well over the WAN, but you may want to experiment to determine the optimal packet size based on your networking situation.

Finally, Novell has introduced a SAP filter. Without this filter, SAPs issue broadcasts every 60 seconds or more indicating which servers are available. As discussed above, this can impact net performance — not to mention that it is unnecessary because new services are typically not added every minute to the server.

In choosing a routing protocol for IPX, RIP may be the only available choice, depending on the router vendor. While this is less than ideal, the SAP filter will at least help matters. More efficient intelligent routing protocol choices include Cisco's EIGRP and a new routing protocol that Novell is working on called NLSP. This link-state algorithm will also provide support for load-balancing traffic, sorting net addresses, more intelligent selection of routes and update-only route table exchanges.

## INTEGRATING LAN/SNA TRAFFIC

Novell creates some problems with its IPX protocol, but SNA users have their own set of issues with which to grapple. Many companies are using frame relay to consolidate LAN and SNA networks, thereby saving substantially on networking and operational costs. Instead of operating and managing multiple physical networks, combining the SNA and LAN networks provides a reduction in the number and cost of local loops and IXC facilities, and streamlines network monitoring and management.

The standard approach for integrating LAN and SNA traffic over a frame relay backbone has been to use a router that implements source route bridging (SRB), Data Link Switching (DLSw) or some other approach to SNA tunneling, or SDLC-to-LLC conversion.

Frame Relay Assemblers/Disassemblers (FRAD) offer a similar solution. Many FRADs accept a variety of incom-

ing protocols, including X.25, SDLC and frame relay.

IBM sees a flaw in these approaches because they are TCP/IP-oriented and do not

provide the same level of SNA-based routing or congestion control and traffic prioritization.

In LAN and SNA consolidation and migration, as in many other areas, IBM does not offer

# 10 steps for implementing a frame relay network

## Document the business case for changing your current net topology.

Clearly spell out and prioritize the reasons for modifying the current network. This will provide guidance for making decisions in each of the following areas: What are the goals in changing the existing network? Is improved performance of existing applications required? If so, what is the existing performance, and what are the objectives? Or is the primary objective lowering monthly costs? If so, what level of savings are expected?

## Develop an initial network topology and site inventory.

Start with a high-level design showing which sites will connect directly to the network and the connectivity required between sites. Estimate the connection speeds required at each location based on the connectivity being supported. Are there remote locations that may need dial-up connectivity instead of dedicated? Are there locations with spare capacity on existing DS-1 loops that can be used?

## Devise a network consolidation plan.

Look at all the applications that may be run between sites. Are there plans to consolidate parallel LAN and Systems Network Architecture networks onto one backbone? Will SNA be encapsulated into TCP/IP, or vice versa? Should traffic be logically partitioned using separate permanent virtual circuits, or consolidated both physically and logically?

## Concoct a networking strategy.

Decide what protocols will run across the WAN and how they will be handled. For example, will some or all of the protocols be encapsulated into TCP/IP? Are link-state or dual-state routing protocols currently used, or are there also some periodic protocols? How will broadcast traffic be handled? Is there a prioritization strategy between networking protocols, and if so, will they be prioritized by address, protocol or packet size?

## Develop a network management strategy.

Note your existing network or information systems resources. Is there a network management tool, such as a Simple Network Management Protocol-based monitoring system? Will significant training be required for the staff to handle the network management? Once the network is up and running, who will have responsibility for operations? Will this be done in-house, or would you prefer your carrier to provide the daily monitoring and management?

## Choose a carrier.

To become familiar with the current frame relay services, develop a request for proposal to distribute to the carriers. Soliciting carrier bids will prove a valuable source of information and education, and could provide alternative network configurations from which to choose.

## Select an equipment vendor.

Determine what type of equipment is needed at each site. Will routers or Frame Relay Assemblers/Disassemblers be used? How will remote office connectivity be handled? Determine who will initially configure, install and maintain the equipment required for the new network. Some of these options may be included in carrier services.

## Develop a disaster and network recovery strategy.

Are there any critical locations for which diverse local-access facilities may be required to ensure near 100% availability? Will a dual-homing configuration be used so point of presence redundancy is achieved, as well? Is there a hot or cold backup disaster site to which connectivity must be established in the event of a major outage at the primary data processing center? If so, what time frame for reconfiguration is needed, and is annual or biannual testing required?

## Benchmark network and application performance.

Run benchmark tests for major applications over the existing network, then benchmark the frame relay network performance immediately following implementation. This will provide guidelines for keeping the network optimized as conditions change. For the first three to six months, keep an eye on how the new net is performing and fine-tune it. Nearly all frame relay services offer the option of hard copy or on-line performance and utilization reports. You may find after six months that the utilization of many PVCs is extremely low — possibly under 10% — and that you can reduce your committed information rate, and thus reduce your costs.

## Plan your migration strategy.

Does the net change frequently, or is it growing rapidly? Are there a number of growing WAN applications that are bandwidth-intensive? Will sites be added to or deleted from the WAN over the next six to 12 months? Is there a need for migrating some sites — perhaps a primary site — to higher speeds, or perhaps ATM, in the next two to three years? Understanding these future requirements might sway your choice of service providers or network equipment.

## Relative broadcast traffic levels in large networks

Network protocol	Routing protocol	Relative broadcast traffic level
IP	RIP	High
	OSPF	Low
	IS-IS	Low
	IGRP	High
	EIGRP	None
IPX	RIP	High
	SAP	High
	EIGRP	Low
AppleTalk	RTMP	High
	EIGRP	Low
DECnet IV	DECnet	High
DECnet V	IS-IS	Low
VINES	RTP	High
	Sequenced RTP	Low
ISO/CLNs	IGRP	High
	IS-IS	Low

RTMP = Routing Table Maintenance Protocol  
RTP = Real-time Transport Protocol

SOURCE: TELECHOICE, VERONA, N.J.



a single clear-cut path for SNA users.

Frame relay migration is no different. Users can choose an alternative — depending on the size of their nets — whether they want to maintain some subarea traffic or they want to truly send SNA over the internetwork.

IBM now widely supports Ethernet and token-ring LANs on the 3174 and 3745 controllers. The protocol for using LAN transmission media for SNA traffic is the LLC2 protocol. LLC2 is the SDLC equivalent for LANs.

LAN-attached PCs running SNA applications can use LLC2 to send data to the mainframe. A LAN-attached router will either SRB, DLSw or route the traffic via Advanced Peer-to-Peer Networking or the improved APPN protocol known as High Performance Routing (HPR), sometimes called APPN Plus.

With SRB, the LLC2 session passes transparently through the router and is not locally terminated. In large networks, this can cause an unacceptable level of congestion on the wide-area frame relay network.

There can also be time-out problems with the sessions because the polling is not locally terminated. This is exacerbated if the number of network hops is greater than two.

HPR and all of its supporting elements, including dependent LU Requestor (dLUR) and dependent LU Server, is another path to consolidate LAN and SNA, and it enables SNA to be routed on the WAN. Routers that support HPR and can act as a Network Node with dLUR will be able to route the SNA traffic.

The result, once this solution is available, will be an integrated environment that supports subarea SNA, next-generation client/server transactions based on HPR, and LAN applications, including protocol support for TCP/IP, IPX and other protocols.

DLSw works the same whether the SNA equipment is LAN-attached or directly attached to the router. With DLSw, the router will terminate the polls locally, improving network response time and decreasing the congestion over the WAN by filtering out most of this polling traffic.

## DIAL BACKUP

SNA issues aside, frame relay has proven to be a very robust technology with respect to network failures over the last three years. Access into the network, however, can still present an area of potential vulnerability. Since initial implementations, users have clamored for more protection of their local loops.

In the quest for site backup, many users have mistaken dial-up capabilities with switched virtual circuits (SVC). SVCs are independent of the access solution being used. What is really needed is the ability to dial up into the frame relay network and perhaps even into the very same port connection to which connectivity has been lost. Once connectivity is established into the network, the net will either use PVCs or SVCs to provide a path to other frame relay port connections.

Dial-up frame relay can be implemented via several alternative configurations. But generally, modems establish standard dial-up analog connections into the carrier's network. Depending on the carrier's service, the underlying protocol might be X.25, Serial Line Internet Protocol, TCP/IP or one of several others. The carrier's network terminates the connec-

tion into equipment that performs a protocol conversion into frame relay.

The carrier may have one or more modem banks that are shared by all dial-in customers and are connected into network servers in the carrier's point of presence (POP). Customers are given a phone number to dial, perhaps a nationwide 800 or 900 number, to establish a dial-in connection.

The party dialing in would likely enter a user ID and password to establish the connection into the public network. This serves as a security point to keep unauthorized parties from utilizing your frame relay backbone. It also will provide the server with information on the port connection and PVC to which the call should be routed.

Even with the new services, in most cases, users will not be able to dial back in to the same port connection. This is because the local loop is blocking the port connection and will not automatically move aside to make room for a dial-up connection into that same port.

At least one frame relay service provider, CompuServe, Inc., plans to offer a solution that will allow dial backup into the same port connection. The new service will likely be available late this month and will be delivered using smart data service units (DSU) on each end of the local

loop. The DSU will establish a dial-up connection in the event the primary loop fails. In the POP, the DSU interfaces to the frame relay port connection, which remains the same whether the primary or backup path is in use.

Other carriers will provide a different port connection for dial-in, or dial backup, connectivity. In this solution, one port connection can be shared by many locations nationwide.

Dial backup is not the only way to recover from a failed local loop, although it is the most cost-effective for low-speed remote network locations. A dual-homing configuration can also be used. This would be the optimal solution at sites with DS-1 local access.

In a dual-homing configuration, two full-time, geographically diverse local loops are provisioned from a network location. These loops terminate into different frame relay port connections, sometimes in different cities. Remote locations connecting into this site need two PVCs, one to each port connection. However, the speed of each PVC only needs to be half of what it would be in a normal configuration. The router at each site will load-balance the traffic between the two loops and two PVCs, as long as both are active.

If one of the dedicated loops at the primary site fails, then all traffic is routed over the active loop. Performance may be temporarily affected, but connectivity is not lost.

## AVOIDING HEADACHES

If the frame relay network is to provide optimal price and performance, there are many issues that must be taken into account before and during network implementation. A little research, self-education and preplanning can save many late hours and spare you those Excedrin moments.

♦ Heckart is a director of broadband with TeleChoice, Inc., a Verona, N.J., consultancy specializing in broadband network services and other advanced telecommunications technologies. She can be reached via MCI mail at checkart or 696-6902.

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## CNE disagrees

I disagree with Ben Rothke's assessment of the Certified NetWare Engineer (CNE) program (Dec. 12, 1994, page 51).

I have been a CNE for about eight months and think the CNE is a good measure of a person's knowledge. However, just like any certification, it reflects only the person's knowledge, not necessarily their ability. Everyone must demonstrate their ability to prove their worth to a company, and a CNE certification is only the beginning.

Alan Downs

Network systems engineer

ValCom, More Than Computers, Inc.

Middleton, Wis.

## Addressing the mess

I enjoyed your article about the IP address mess (Dec. 19, 1994, page 1). Where can I get more information about the next-generation IP (IPng, formerly IP Version 6), which seems to be the answer?

I find your publication very interesting and look forward to reading it. Thanks in advance for your help.

David Grimason

Project manager

Dow Chemical Co.

Midland, Mich.

Editor's response: The URL on the Web is <http://playground.sun.com/pub/ipng/html/ipng-main.html> for more information about the IPng.

## More on RMON

"Network Help Desk" is one of the first items in NWI read each week. However, I take issue with parts of the response to the reader who sought information about Hewlett-Packard Co.'s NetMetrix and other Remote Moni-

toring (RMON) products (Dec. 12, 1994, page 2), which was provided by Brett Curtis and Ron Cooney of Paraneet, Inc.

First, NetMetrix supports full implementation of RMON and is indeed able to use agents from other manufacturers to collect data. In fact, HP appears to have greater interoperability with RMON agents from other manufacturers than any other RMON solution available today.

Second, the RMON Management Information Base (MIB) consists of nine groups for Ethernet, not eight, and 10 groups for token ring, not eight.

Third, IBM NetView, HP OpenView and SynOptics Communications, Inc. Optivity are not RMON solutions and do not include RMON compliance in the basic package. IBM and HP offer add-on modules for RMON support, and third-party RMON solutions are available from a number of vendors that will integrate with these enterprise network management systems.

Optivity manages SynOptics devices and offers statistical information similar to some of the RMON MIBs, but it is not an RMON solution.

RMON solutions are available from HP; AXON Networks, Inc.; Network Application Technology, Inc.; Frontier Software Develop-

ment, Inc.; Armon Networking, Inc.; IBM and a number of other manufacturers. We caution users that the RMON RFC allows vendors to state RMON compliance, even though they may only support one of the nine or 10 RMON MIBs.

Users need to be aware of the differences between hardware and software agents, and should be careful not to be seduced by a slick graphical user interface that may camouflage a shallow application hiding underneath. Performance issues also may be a concern when comparing embedded RMON in a connectivity device vs. dedicated stand-alone RMON agents. Proprietary enhancements above and beyond the RMON MIB should be carefully considered.

Ira Bleiweiss

Sales manager

4GL Corp.

Houston

Curtis' and Cooney's response: Our company, Paraneet, is an unaffiliated computer network services provider. We volunteered information about NetMetrix because of our familiarity with the product. We're glad NW can provide others with the opportunity to supply the reader with additional information to help them in their decisions.

## Help desk

Continued from page 2

access without preventing a possible security breach.

The software can be configured to require its own logon ID and password combination, independent of what NetWare will require. This serves as an additional layer of security by requiring a logon to the PC before access to the network is even allowed.

This additional layer of security will establish several safety precautions that should make the most meticulous internal auditors happy. First, you are using a program that is not likely to be in the arsenal of most users. Also, you are requiring an additional logon before network access is granted. Although the phone number being dialed should be known to everyone in your company, the company's sensitive data will stay on the network instead of traveling outside the building.

The last step you should take is to configure

pcAnywhere to break the connection between the PC and the LAN as soon as the connection from home is broken. This will prevent someone inside the building from accessing the LAN from the MIS director's PC.

I am working in a contractual relationship with the Department of Housing and Urban Development. They are interested in using metropolitan-area network services to tie LANs together at all of their regional offices. These offices are located in Atlanta; Boston; Chicago; Denver; Fort Worth, Texas; Kansas City, Kan.; New York; Philadelphia; San Francisco and Seattle.

Could you tell me what companies offer services in these areas?

John Sestok, Lanham, Md.

NW suggests you check our LAN interconnectivity services Buyer's Guide in our Jan. 9 issue. It starts on page 35 and includes a comprehensive chart of companies offering LAN interconnectivity services. ☐

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# IP innovation fosters mobility without address headaches

By Bob Richard

**A** new version of the popular IP is in the works that should address a major shortcoming of existing mobile computing solutions that attempt to extend network PC users' range beyond the desktop.

Mobile IP, which is being developed by the Internet Engineering Task Force's Mobile IP Working Group, will enable you to move a node among subnets without changing the node's IP address.

Conventional network architectures have not been able to meet the needs of mobile computer users because the static addresses of traditional network architectures bind a computer to a specific LAN or subnet. Current versions of IP, for example, assume that an IP node has a fixed point of connection to its network. Other net nodes send datagrams that are routed to the node using location information contained in the node's IP address. If you move the node without changing its IP address, however, the standard IP routing protocols are unable to direct messages to the node.

This is conceptually similar to maintaining telephone access when you move to a new home or office. When you move, you must obtain and advertise a new area code and number (essentially, a new network address). Anyone who calls your old telephone number will not be able to reach you. In the networking arena, if you move a node to a different subnetwork but want to have access to all the services on the original IP subnetwork, you need to change its IP address. Network managers are not amenable to frequent IP address changes because existing networking applications may not function properly, and the address change may force the user to perform manual node reconfiguration.

As large numbers of network users become mobile due to changes in the work processes, it is becoming more difficult for network managers to perform the number of address changes that result as well as perform other net management tasks.

That's where Mobile IP comes in. Mobile IP lets you create the same environment and have access to the same level of services, regardless of where you have made the physical connection to the network because the node keeps its permanent IP address. This is extremely useful if your company has mobile users who travel to various sites with LANs that are connected through your corporate infrastructure. Also, when you are at a site with in-building sub-

nets that support wireless networking, you can roam from one wireless subnet to another without losing any ongoing wireless network connection.

### HOW MOBILE IP WORKS

To achieve IP address mobility, each Mobile IP-equipped device registers with a home agent. This agent is essentially a router or a server that broadcasts its accessibility to all mobile nodes, maintains a registry of the current status of mobile connections for each node and encapsulates datagrams for delivery to each mobile node while it is connected to another network. The home system manager assigns each mobile node a password tied to its IP address.

To describe how Mobile IP enables transparent networking, I will discuss several possible scenarios involving a portable device connected to a Mobile IP-equipped network.

To fully understand the flexibility Mobile IP affords you, I will consider several deployment scenarios. The most common is the normal state in which a mobile device is connected to its home subnet. Consider a mobile node (MN1) attached to its home subnet. In this case, except for some configuration details, Mobile IP functions as if MN1 was a fixed entity on the network. As with a conventional IP network, MN1 directly exchanges datagrams with other nodes on the network. MN1's IP address is used whether it is attached to its home network or attaches to a foreign network.

### THE FOREIGN FACTOR

In the graphic, MN1, whose home subnet is Subnet A, has moved and is now attached to Subnet B. Subnet B, of course, has its own router. MN1 becomes a visiting mobile node in Subnet B, and the server or router in Subnet B becomes MN1's foreign agent. A foreign agent is a router that assists a mobile node, in this case MN1, from another network. The foreign agent, in effect, serves as a corresponding agent, which passes data between MN1 and its home agent.

When MN1 attaches to Subnet B, it listens for agent discovery advertisements broadcast by the foreign agent for Subnet B. If MN1 detects the advertisement, it registers itself by sending the address assigned to it by the foreign agent, or care-of address, to its home agent. MN1 also sends a shared key or password to its home agent through the foreign agent in the subnetwork. If MN1 does not detect an agent discovery message, however, it sends a solicitation message of its

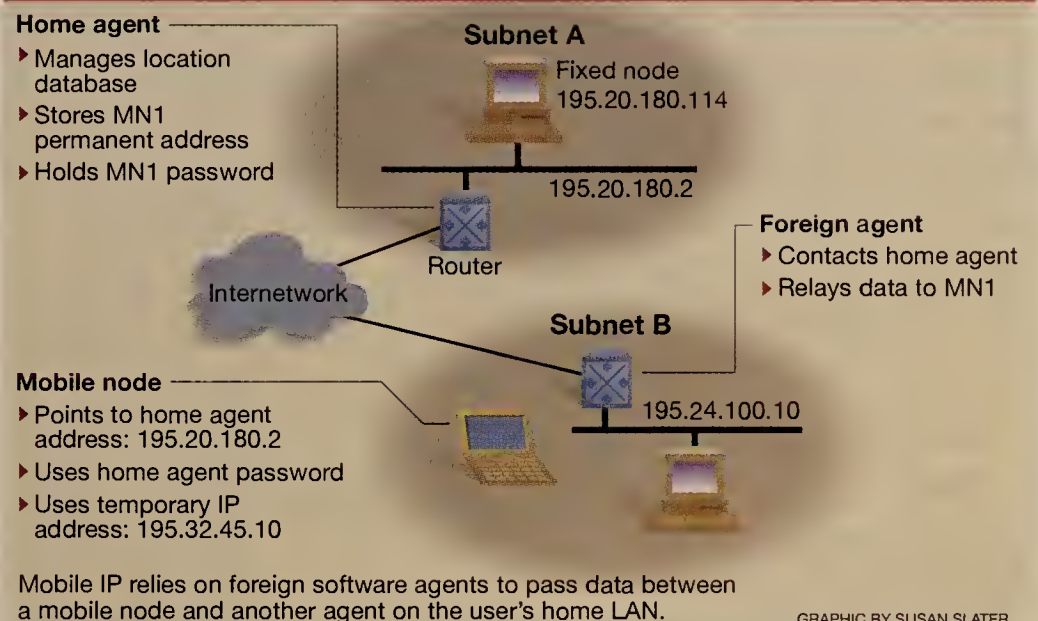
own to the foreign agent. Once it recognizes the foreign agent, MN1 transmits the necessary registration information to its home agent.

Once the home agent has authenticated MN1's new location and care-of address, it becomes responsible for forwarding packets to MN1 in the foreign network. The home agent intercepts all datagrams addressed to MN1 using an IP method called the Proxy

### HOMING IN ON HOME BASE

When you disconnect a mobile node from the remote subnet, the mobile node notifies the home agent and the foreign agent (from which it is disconnecting) that it has done so. When you reconnect the node to its home network, it notifies the home agent that you have done so. The home agent then stops forwarding datagrams to the mobile node, and the mobile node resumes conven-

### Software agents' role in Mobile IP



Address Resolution Protocol. Correspondent nodes — for instance, any nodes that are communicating with MN1 — direct all messages addressed to MN1 to the home agent. The datagrams are tunneled, or forwarded, to the care-of address for MN1. Conversely, datagrams sent by MN1 are routed through the foreign agent directly to the correspondent node.

### NO FOREIGN AGENTS

If you connect a mobile node to a foreign subnet that does not contain a foreign agent, the mobile node can act as its own foreign agent. First, it obtains a temporary IP address that is valid in the foreign subnet. The mobile device usually can get this address from a Dynamic Host Configuration Protocol (DHCP) server.

The mobile node then registers directly with the home agent by sending the temporary address and its permanent authentication key to the home agent. The temporary address now becomes the care-of-address for the mobile node. Once the registration is complete, correspondent nodes can communicate with the mobile node, just as foreign agents are able to.

tional IP transmission and reception.

Mobile IP can be configured so you can request simultaneous registration — if this feature is supported by the home agent. With simultaneous registration, you maintain two care-of addresses in two or more foreign subnets. This feature is particularly useful in a wireless scenario, where the mobile node may be roaming between multiple radio cells.

### INDISPENSABLE ASSET

Currently labeled as a draft standard within the IETF, Mobile IP should mature over the next year following conformance testing. While the technology is still in draft form, vendors such as Digital Equipment Corp. are beginning to deploy the software in their products. Digital, in fact, today embodies Mobile IP in its RoamAbout MobileIP, a TCP/IP stack with Mobile IP functionality that runs on a DOS or Windows machine.

♦ Richard is director of product development for the Mobile Software Business Group at Digital Equipment Corp. He can be reached via the Internet at richard@ljo.dec.



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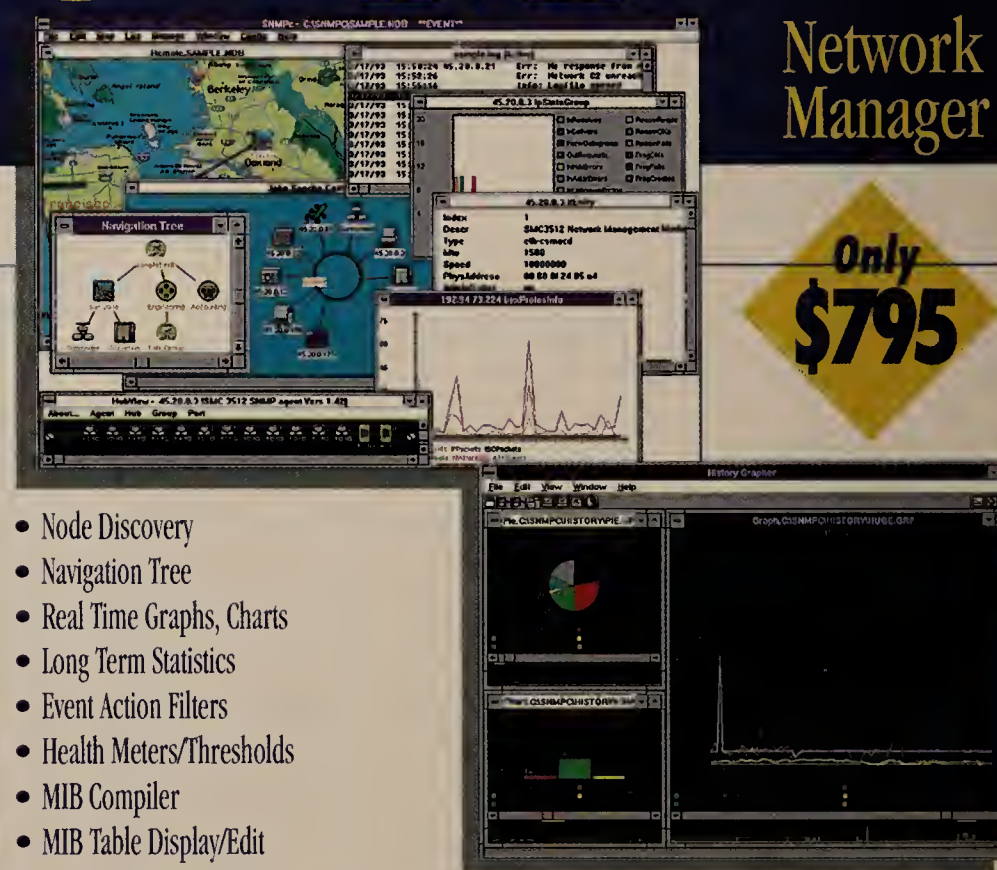


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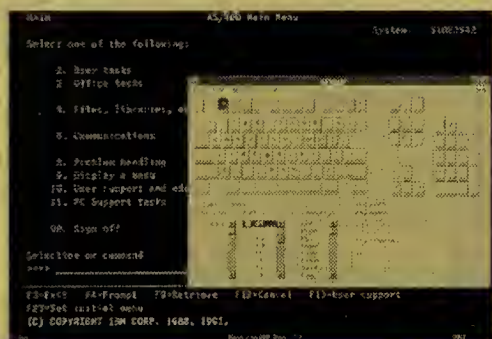
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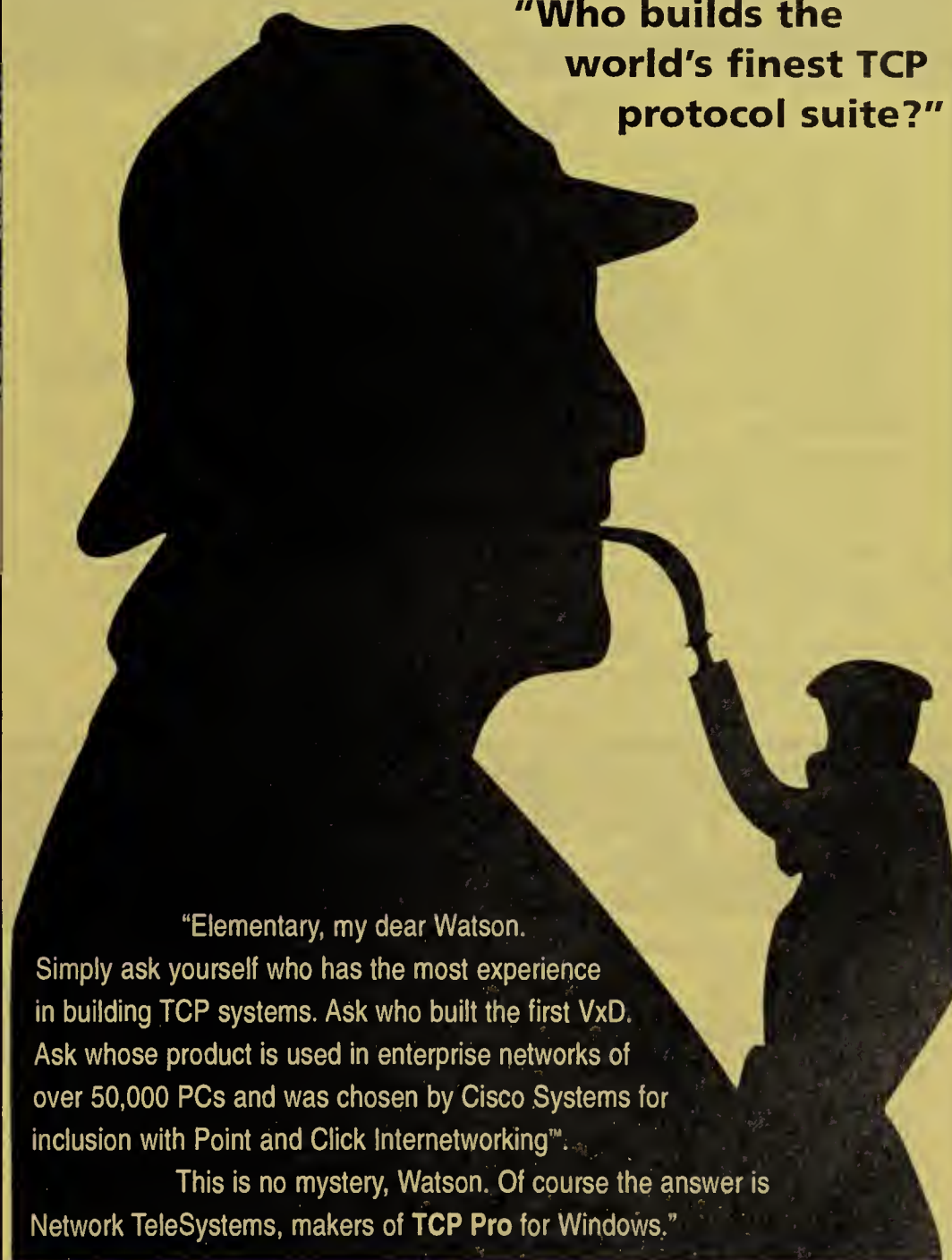
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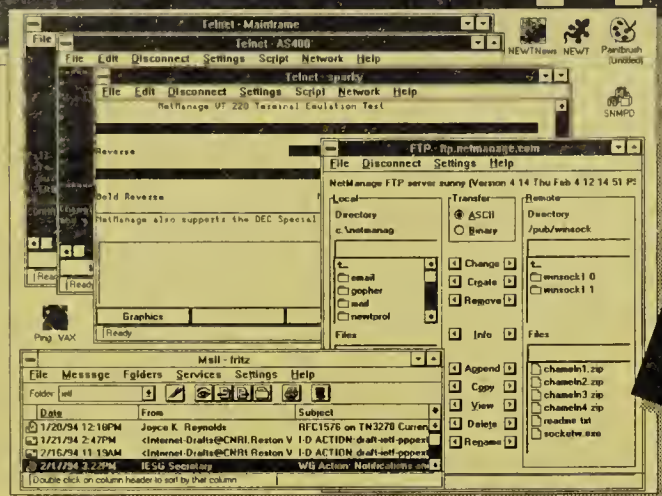


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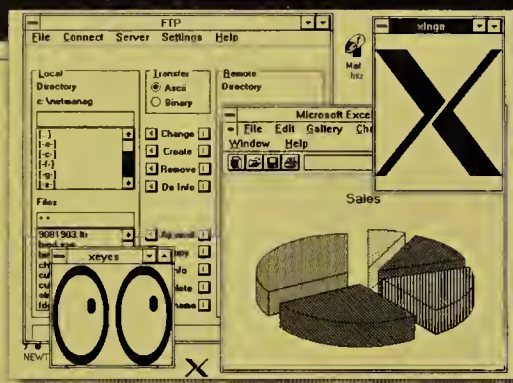
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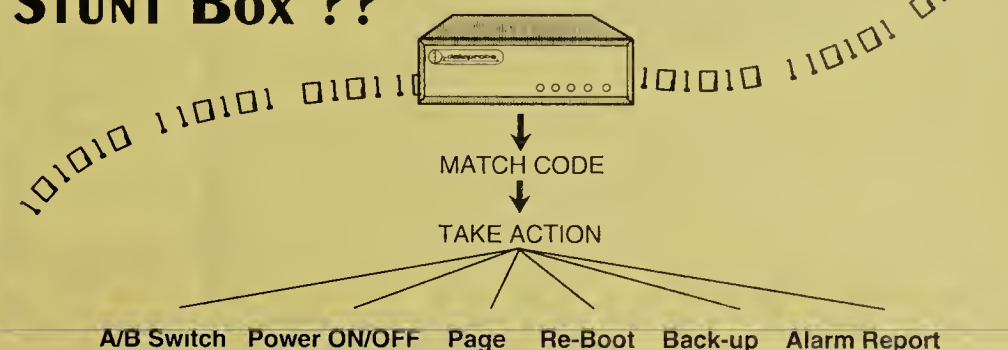
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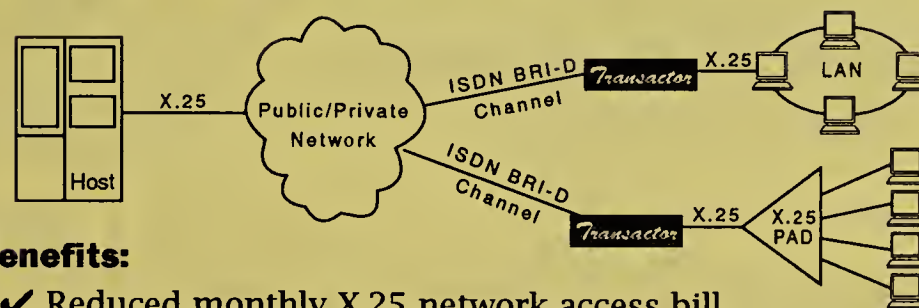


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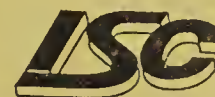
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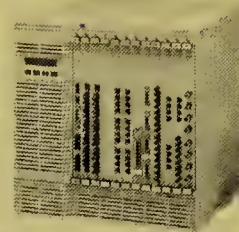
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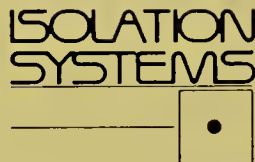
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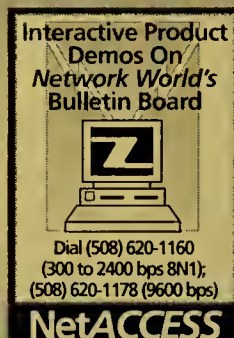
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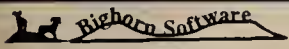


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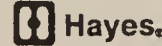
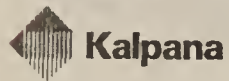
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# Solstice

Continued from page 1

These are lofty goals, but there is much integration work remaining. The new enterprise management platform, called Solstice Enterprise Manager, currently cannot share event data with Sun's existing workgroup system, SunNet Manager. This means the two systems are incapable of cooperatively resolving faults.

Furthermore, SunNet Manager and Solstice Enterprise Manager do not yet share a common object code base. This means the two platforms cannot model the managed network — represent characteristics of and interrelationships between managed objects — in a consistent fashion.

SunNet Manager and Solstice Enterprise Manager will share event data later this year, promised Denis Yaro, vice president and general manager for Enterprise Management Products at SunSoft, Inc., Sun's software development subsidiary. Sun also



**Yaro says the Solstice platform will share data with SunNet Manager and potentially other vendors' platform.**

plans to add object technology to SunNet Manager so the workgroup manager can attain some of the same features, such as object data modeling, that the enterprise platform has.

Yaro did not disclose a time frame for Sun's addition of object technology to SunNet Manager.

## ACCOMPLISHMENTS

Despite the work that still needs to be done, Sun did show off its accomplishments since announcing the NetLabs arrangement.

The new Solstice Enterprise Manager provides distributed fault, event and performance management of global networks comprising tens of thousands of objects. In contrast, SunNet Manager is optimized for managing two to five networks and 500 to 1,000 objects.

Thirty percent of the final code for Solstice Enterprise Manager is from NetLabs, Yaro said.

In Solstice Enterprise Manager, Sun is the first of the leading Simple Network Management Protocol platform vendors out of the chute with an object-based distributed management system. IBM can add distributed capabilities to NetView for AIX via its Systems Monitor offering, but work on the object-based Karat project is still in progress.

Hewlett-Packard Co., meanwhile, will not have a distributed version of HP OpenView out until next year. An object-based, distributed OpenView is expected sometime thereafter (NW, Jan. 23, page 1).

## NETWORK WORLD

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# IBM, Novell

Continued from page 1

The Novell, IBM and Bus-Tech team has already shipped a NetWare-optimized 3172, known as the 3172-BTI, that allows direct mainframe channel attachment of NetWare LANs.

Bus-Tech is also working with IBM and Microsoft to offer a customized 3172, the 3172-NT, to connect Windows NT SNA Server users directly to IBM mainframe resources. That unit currently is in beta-test (NW, Oct. 10, page 1).

Bus-Tech's new IBM-Novell based products, according to sources, will be built on stripped-down versions of IBM's 3172 Interconnect Controller and may cost less than \$5,000.

One model will support a single token ring or Ethernet LAN adapter and two wide-area links at speeds of up to T-1. It will be positioned as a low-end feeder node or branch office access point to larger SNA backbones.

**"The advantage of the bundle for network managers is that it gives you LAN and WAN connectivity products you could roll out to remote sites," Borovick said.**

The larger model will be built on IBM's Pentium-based, channel-attached 3172 Interconnect Controller but will be stripped of its mainframe channel interface. It will feature six slots that can be configured to support a variety of LAN or WAN links. WAN links would be limited to T-1 speeds. It will be positioned for use with larger branch offices, sources said.

On top of these, Bus-Tech will sell bundles of IBM's OS/2 Communications Manager or Novell's NetWare for SAA or Multiprotocol Router (MPR).

Sources said the products will enable Bus-Tech to offer users a menu of connectivity choices: They can pick the OS/2 Communications Manager to link multiple network operating systems across the LAN; they can opt for NetWare for SAA to send LAN traffic directly from a branch office to a gateway; or they can choose MPR to route traffic among branch offices across SNA or TCP/IP networks.

MPR is a software-based router that can pipe SNA and NETBIOS traffic over TCP/IP backbones using Data Link Switching.

An MPR add-on module, called SNA Extensions, adds support for the LU 6.2 protocol and can also let TCP/IP, IPX, SPX or AppleTalk traffic flow over SNA backbones using LU 6.2 as the underlying transport, said Michael Ober, product-line manager for the NetWare Systems Group.

NetWare users can monitor, track and control SNA traffic across SNA or TCP/IP backbones from a single site using ManageWise, a bundle of Novell's NetWare Management Service and Intel Corp.'s LANDesk Manager systems management product.

"The advantage of this [bundle] for network managers is that it gives you, in one complete package, LAN and WAN connectivity products you could roll out to remote sites," said Cindy Borovick, an analyst at International Data Corp. in Framingham, Mass.

A Novell official described the integration as an extension of existing OEM relationships between Bus-Tech and the other two companies.

Neither Bus-Tech nor IBM could confirm the plan. "We have had a very strong relationship in selling host-based, channel-attached processors with IBM, and we're looking to expand that into branch office connectivity," said Joe Makoid, vice president of sales and marketing for Bus-Tech. He declined to be more specific about the roles of either Novell or IBM in the deal.

## Comments?

See "How to reach us" on the back page.

"Sun has a window of opportunity to really step up," said John McConnell, president of McConnell Consulting, Inc. in Boulder, Colo. "If they don't, then it won't matter that [HP] slipped."

Priced at \$19,500, Solstice Enterprise Manager is available now.

Another achievement is Cooperative Consoles, software that adds multiuser capabilities to the single-user SunNet Manager. It allows multiple SunNet Managers to cooperatively handle multiple network domains.

Sun will allow SunNet Manager and Solstice Enterprise Manager to share event data via Cooperative Consoles later this year. Cooperative Consoles can also foster manager-to-manager communications between Sun's platforms and other vendors' systems, such as OpenView and NetView for AIX, Yaro said. He expects some of Sun's competitors to announce such intentions later this year.

That would hit home with users.

"We have different products managing different domains, and it would be nice to have cross-domain management," said Joe Vassallo, vice president of Sun product development for Oracle Corp.

Cooperative Consoles costs \$3,150 and is available now.

Sun also rolled out Solstice AutoClient, which allows users to download and store the software they need at their desktops from centralized servers. AutoClient costs \$2,495 and will be available in March.

Lastly, Sun unveiled FireWall-1, software that enables connectivity with Internet resources without compromising internal network security. FireWall-1 costs \$4,990 and is available now.

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# Wells Fargo

Continued from page 1

rity for "sealing" data so that it cannot be read or detoured.

At the bottom level, a message integrity algorithm generates a consistent number every time data is sent, provided it has not been corrupted. If the number comes up different, this is a warning to the recipient that the message may have been intercepted.

At a second level, RSA Data Security, Inc.'s encoding scheme embedded in PEM also sends with each message a digital signature encrypted with a private key. As with the integrity algorithm, this in itself does not protect the data, but it does enable the recipient to verify that the sender is whom he claims to be.

Security for the message contents is provided using the Data Encryption Standard scheme and RSA public and private keys.

The government-sanctioned RSA scheme "is the toughest encryption and security [there is]," said Kurrasch, who explained that running RSA-integrated PEM from end station to end station is as secure a procedure as the bank could hope to get, regardless of the transmission medium.

Robert Frank, president of Robert

Frank & Associates and chief scientist at Lawrence Livermore National Laboratory in Livermore, Calif., said it is important to install PEM at the end sites of a connection — as opposed to relying on it solely on an Internet access provider's host — so that data is protected end to end.

In the Wells Fargo configuration, which Frank helped design, PEM sits on a Sun Microsystems, Inc. workstation in the bank's data center. The workstation is front-ended by a Tandem Computer controller and firewall. The firewall accepts or denies access to the bank's private net from outside users based on predefined policies and procedures.

Kurrasch is bullish on the setup so far. "This is more reliable than the VANs, where we'd dial up a mailbox to download a payment that might not be there," Kurrasch said. A transaction traversing a VAN can take a day or two days if inter-VAN connections must be made, he said.

The Wells Fargo pilot represents the first use of the Internet for sensitive payroll data, according to Frank, who was the former EDI working group chair for CommerceNet, a consortium of companies figuring out how to securely do business across the Internet.

"It's radical for EDI, because it shows that anyone with an Internet connection can exchange EDI transactions," he said. □

**The government-sanctioned RSA scheme "is the toughest encryption and security there is," Kurrasch explained.**



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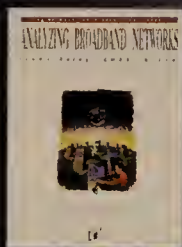
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- ▼ Discover the roles of the broadband implementers: the ATM Forum, the Frame Relay Forum and the SMDS Interest Group.
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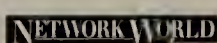
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# Back to Reality

Tired of high-speed LAN talk? The real race is just starting.

BY DAVID J. BUERGER

Vendors have hummed the fast-LAN mantra so long that many users are numb. Yet for all their talk during the past two or three years, vendors have had little to show in the way of products you can buy.

This comment is not about Asynchronous Transfer Mode. Of the relatively few ATM buyers, most are putting it onto the LAN backbone. Typical mortals cannot cost-justify ATM to the desktop, so this technology will remain a backbone solution for several years.

The product dearth I'm referring to involves the other "great debate" — 100Base-T, or fast Ethernet, vs. 100VG-AnyLAN. Both 100M bit/sec LAN technologies claim large groups of pledged vendors. And both have users equally confused.

The clever arguments for these technologies have played off users' fears that their networks will run out of steam. But whether those fears are real or imagined, the lack of products has made it difficult to judge the merits of each technology.

That's about to change. Last week, the 100VG-AnyLAN Forum brought together about 55 reporters and analysts in San Francisco for a pep rally — or, as one fast Ethernet vendor called it, a "revival."

Forum members hoped to prove that 100VG is not dead and is a viable contender to 100Base-T. Seems like an odd goal. While fast Ethernet has had more vociferous vendor support, neither technology is setting new customer records.

The real question is why users would need either one.

After all, 10M bit/sec Ethernet seems adequate for most needs. It's certainly cheaper. And it's easy to add a workgroup switch for dedicated 10M bit/sec links for the occasional bottlenecked workstation — without changing network adapters.

But network managers shouldn't stick their heads in the sand. For one thing, some users *do* need more speed; applications such as video services for Lotus Notes demand it.

And price is becoming much less of an issue. For example, retail prices for network adapters for both technologies range from \$250 to \$400, and those are dropping fast.

These reasons, along with the need to unclog high-use LANs, are why fast Ethernet and VG-AnyLAN will shortly become part of your daily vocabulary.

Fast Ethernet claims superiority because it's simply plain old Ethernet done faster. Its sameness is supposed to bring comfort to nervous network managers who are reluctant to switch.

That sameness means users must still contend for bandwidth, albeit on a faster pipe. Yet it's hard to know how emerging multimedia applications will affect a shared-media LAN.

VG-AnyLAN claims to lick this problem with its Demand Priority transmission scheme. Users get their own channel

to pass data without having to contend for bandwidth.

That's the theory. But what happens in the real world?

Believe it or not, no one really knows. Trade publications are just starting to test fast Ethernet and VG-AnyLAN; so are users. Marketing slogans don't mean squat until you try out the technologies in your own setting. You've got to prove it yourself because vendors are not doing it for you.

The pep rally, along with my informal survey of fast Ethernet vendors, suggests that the product drought is about to end. Expect shipping announcements from both camps to start flowing now.

One thing that will hold back both technologies is the lack of support in internetworking gear. Router vendors say interface support is coming later this year.

Until it does, fast Ethernet and VG-AnyLAN will stay mired in the workgroup.

## Bundle of irritation

Our lead story on service and equipment bundling is another case of old laws that need to be erased from the books.

Carriers, of course, are looking for ways to circumvent an old FCC rule meant to protect customers. A group of

some — but not all — premise equipment vendors wants tougher rules enforced. But that view is bad for users.

Data communications is tough. It's hard enough to get things working right. Forcing users to do legwork can be counterproductive. If carriers offer something that works, let 'em pitch the solution to users. The buyer

can always say no.

## Ask the plumber

Creative network users are cool — especially when they come from outside the industry.

An innovative plumber in Philadelphia had a great idea; unfortunately, it landed him in jail.

The guy used Bell Atlantic's Call Forwarding Ultra, a service that lets you control call forwarding from a phone other than the one being called. This schemer forwarded his competitors' calls to his own line, intercepting business for a month until one victim was complimented for a job he never did.

Better check your company's PBX. You never know what rivals might do for a promotion.

♦ Buerger is an Atlanta-based industry consultant and contributing editor to Network World. He can be reached at (404) 495-7494 or at dbuerger@pipeline.com.



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## CyberSpeak

Voices from the reader network

Some industry observers say that the lack of security on the Internet makes it unsuitable for electronic commerce. What do you think?

♦ "Why does this sound like people who complain about the performance of a Porsche 911S when used as a floor polisher, or about how their crescent wrench fails repeatedly when used as a hammer?"

Jan Allbright, Hewlett-Packard Co., Mountain View, Calif.

♦ "The Internet is a great tool for businesses but not for doing business electronically. A lot of applications used on the Internet are not encrypted, provide no proof of origin or delivery, and [have] no guarantee of message content integrity. The good news is that those problems are being

solved at the application level, and when they are, the Internet will be suitable for buying and selling time-insensitive items. It will probably never be reliable enough to be used for highly time-sensitive trades."

A network planner at a financial services firm, Boston

♦ "Although Internet traffic is typically transmitted in clear text, data encryption protocols and internet firewalls that use onetime validation provide sufficient security when properly integrated into the corporate net."

Mike Cochran, communications system specialist, Long Beach, Calif.

♦ "Because of the lack of an integrated platform security, conducting business on the Internet is risky unless precautions are taken. Additional self-securing measures include installing a very capable firewall between the Internet and corporate resources, and instituting encryption-based authentication. These can result in having to buy additional equipment and performing more administration, both of which may be too costly to justify the new markets that the Internet can offer."

John Chenard, senior net engineer, American Power Conversion Corp., West Kingston, R.I.

Next Week  
CyberSpeak Out!

Is the law barring carriers from bundling equipment with tariffed services outdated?

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That's just for starters. Advantages like these are real, and they're happening *right now*. Shouldn't some of them be happening for you?

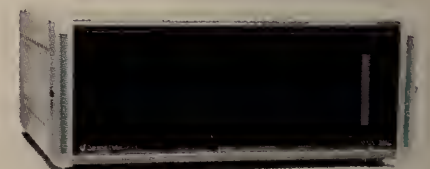
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